SHORT TERM ANALYSIS (RETROSPECTIVE AND PROSPECTIVE STUDY) OF THE FUNCTIONAL OUTCOME IN COMPLEX TOTAL PRIMARY HIP REPLACEMENT

Dissertation submitted in

Partial fulfillment of the requirement for

M.S. DEGREE-BRANCH II

ORTHOPAEDIC SURGERY

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RAJIV GANDHI GOVT. GENERAL HOSPITAL

THE TAMILNADU DR.M.G.R.MEDICAL UNIVERSITY

CHENNAI-TAMILNADU

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CERTIFICATE

This is to certify that this dissertation titled **"Short Term analysis (Retrospective and Prospective study) of the functional outcome in Complex Total Primary Hip Replacement"** is a bonafide record of work done by **DR.M.Ravi ,** during the period of his Post graduate study from May 2011 to May 2013 under guidance and supervision in the Institute of ORTHOPAEDICS AND TRAUMATOLOGY, Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai-600003, in partial fulfilment of the requirement for **M.S.ORTHOPAEDIC SURGERY** degree Examination of The TamilnaduDr. M.G.R. Medical University to be held in April 2013.

Dr. KANAGASABAI.M.D.
Dean
Madras Medical College & Rajiv Gandhi Government General Hospital, Chennai -600 003.

PROF.M.R.RAJASEKAR. M.S.ORTHO ., D.Ortho.
Director
Institute of Orthopaedics and traumatology
Madras Medical College & Rajiv Gandhi Government General Hospital
Chennai -600 003.

DECLARATION

I declare that the dissertation entitled **"Short Term analysis (Retrospective and Prospective study) of the functional outcome in Complex Total Primary Hip Replacement"** *submitted by me for the degree of M.S is the record work carried out by me during the period of* ***May 2011 to December 2012*** *under the guidance of Professor* ***Dr.*****M.R.RAJASEKAR M.S.ORTHO., D.Ortho.,***Professor& Head of the Department of Orthopaedics, Institute of Orthopaedics and traumatology, Madras Medical College, Chennai. This dissertation is submitted to the Tamilnadu Dr.M.G.R Medical University, Chennai, in partial fulfilmentof the University regulations for the award of degree of M.S.ORTHOPAEDICS (BRANCH-II)) examination to be held in April 2013.*

Place: Chennai
Date:

Signature of the Candidate
(Dr.M.Ravi)

Signature of the Guide
Prof.Dr.**M.R.RAJASEKAR M.S.ORTHO., D.Ortho.**
Professor& HOD,
Institute of Orthopaedics and Traumatology,
Madras Medical College, Chennai

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CONTENTS

INTRODUCTION

In Human Body, the Hip joints bear the great responsibility of transmitting the ground reaction force against the body weight and simultaneously preserving the mobility. Any disease / trauma involving hips primarily affects locomotion, disables the Individual's activity of daily living.Patients with painful hips require complete evaluation with standard X-rays, Computed Tomogram (CT) and if necessary Magnetic Resonance Imaging (MRI) to conclude the diagnosis. The treatment protocols for painful hips include Analgesics, Walking stick, Axillary Crutches, Arthrodesis, Osteotomy, Excision Arthroplasty and Total Hip Arthroplasty (THA).

Total Hip Arthroplasty is the Most commonly performed Reconstructive procedure that replaces the Femoral Head, Neck and Acetabular Articular Surface. THA is a highly successful procedure that has made numerous patients return to excellent function without pain and provides a stable, pain-free mobile joint. THA demands accurate surgical technique to reproduce a biomechanically sound joint.

Primary THA is indicated in clinical conditions like Primary Osteoarthritis, Inflammatory Arthritis (without Complications), and Secondaryosteoarthritis (Perthes disease, Avascular Necrosis). With the

evolution surgical techniques and Instrumentation, the clinical indications for THA has been expanded to include patients who were previously considered not eligible for THA. Such Complex indications include Dysplastic Hips, ProtrusionAcceptably, Ankylosed hips, Neuromuscular Disorders, failed osteosynthesis (Previous bony procedures around hip), skeletal Dysplasia and Severe soft tissue contractures around hip.

The surgical techniques employed to restore the Normal Centre of rotation of the Hip joint in complex cases or unique to each case. The assessment of outcome of surgical procedure in complex cases is done by Modified Harris Hip Scoring.

This study is a retrospective and prospective short term analysis of functional outcome in patients who underwent primary THA for complex cases (Compromised Bony and Soft Tissue states). The study based on Cases operated in Our Institute during the Period January 2009 to December 2012

AIM

The purpose of this study is Short Term analysis (Retrospective and Prospective study) of the functional outcome in 30 patients who underwent complex primary hip arthroplasty in our Institute during the period January 2009 to December 2012

HISTORICAL AND LITERATURE REVIEW

A detailed knowledge of History of THA is necessary to know the current status and its future. The evolution of Hip Arthroplasty has reached its present peak through the following stages: Osteotomy Arthroplasty, Interposition Arthroplasty, Reconstructive Arthroplasty, Femoral Replacement Arthroplasty and Total Hip Arthroplasty

1826: John R Barton performed Osteotomy Arthroplasty for ankylosed hips

1902: John Murphy did Tissue InterpositionalArthroplasty using tensor fascia lata

1923: Smith Peterson experienced little success by doing MouldArthroplasty using Glass, Vitallium Cups

1940: Girdlestoneperformed ExcisionArthroplasty by removing Femoral Head, Neck and Acetabular Articular surface

1940: Bohlman and Moore first implanted a metallic prosthesis for Proximal Femur

1948: Judet Brothers used Acrylic (Plastic) femoral head replacement with little success

1950: Thomson refined the Metallic prosthesis to Light Bulb prosthesis

1952: Austin Moore replaced proximal femur using fenestrated metallic stem

1956: The Era of Joint Replacement started as Sir John Charnley, a British orthopaedician usedPolyTetraFluoroEthylene (PTFE) Cups and resurfaced the Femoral Head

1954 - 1974: Charnley's Work pioneered around the concept of Low Friction Torque Arthroplasty using Ultra-High Molecular Weight Polyethylene (UHMPE) Cups with stainless steel Femoral Stem and head diameter 22.225mm. LFA takes into account the lubrication, biomechanics, materials, designs and the operating room atmosphere. He also introduced the cold curing cement for component fixation. Cemented Metal Head on Polyethylene Cups still stood against time as the Gold Standard Procedure in THA Revolution

Evolution of Charnley's stems designs & Polyethylene cups

1980s: The Concept of Uncemented Press-Fit Femoral Stem and Acetabular Cup Arthroplasty developed as a result of Erroneously-blamed Cement Disease. Uncemented Implants depends on the principle of Bone Ingrowth / Ongrowth for durable fixation

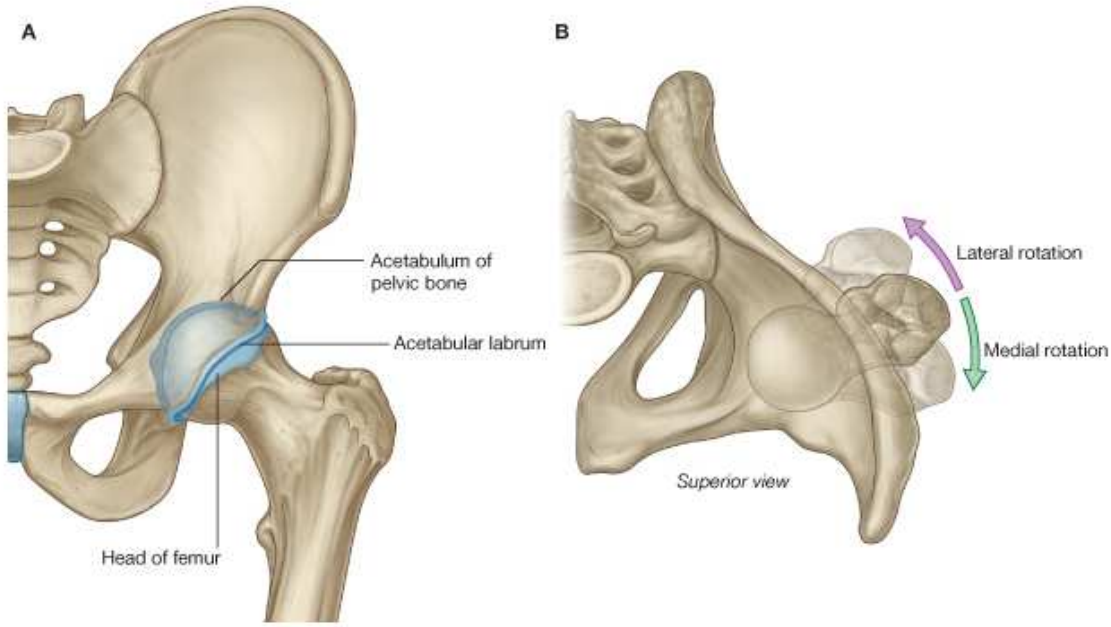
1991: McMinn introduced surface replacement with cobalt chrome alloy

Birmingham implants

S- ROM: Modular femoral stem Shiva's range of movements. Latest revolution in femoral stem for primary, revision and DDH cases. It has a distal pilot, necksleeve, body and a stem.

S-ROM

ANATOMY OF HIP JOINT



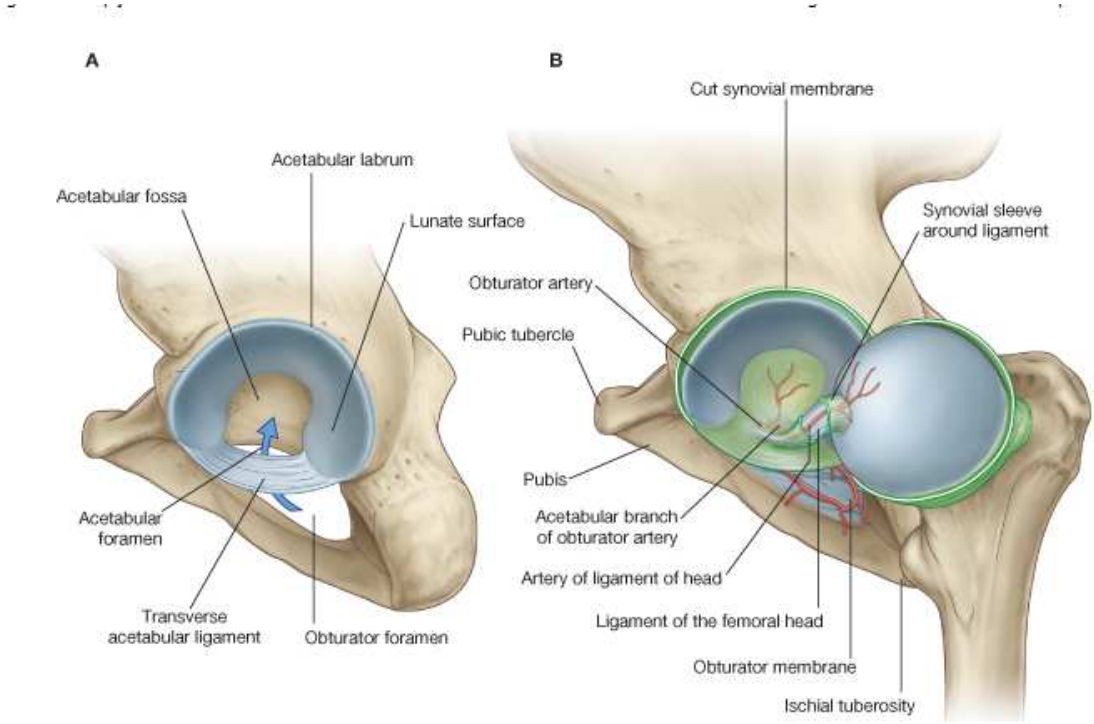
The Hip Joint is a ball and socket variety of Synovial joints. The Femoral head articulates with the concave socket of acetabulum.

The cup shaped acetabulum is formed by the fusion of innominate bones (Ilium, Ischium and Pubis). It contains a horseshoe shaped articular \articular surface with a centralnonarticularacetabular fossa. The acetabular fossa is filled with fat pad and ligamentumteres. Inferior to the fossa, the transverseacetabular ligament completes the acetabular cup. The acetabular is deepened by a rim of fibrocartilagenous labrum.

Femoral head forms 3/4th of a sphere with articular cartilage all around except a central uncovered area called fovea capitis where

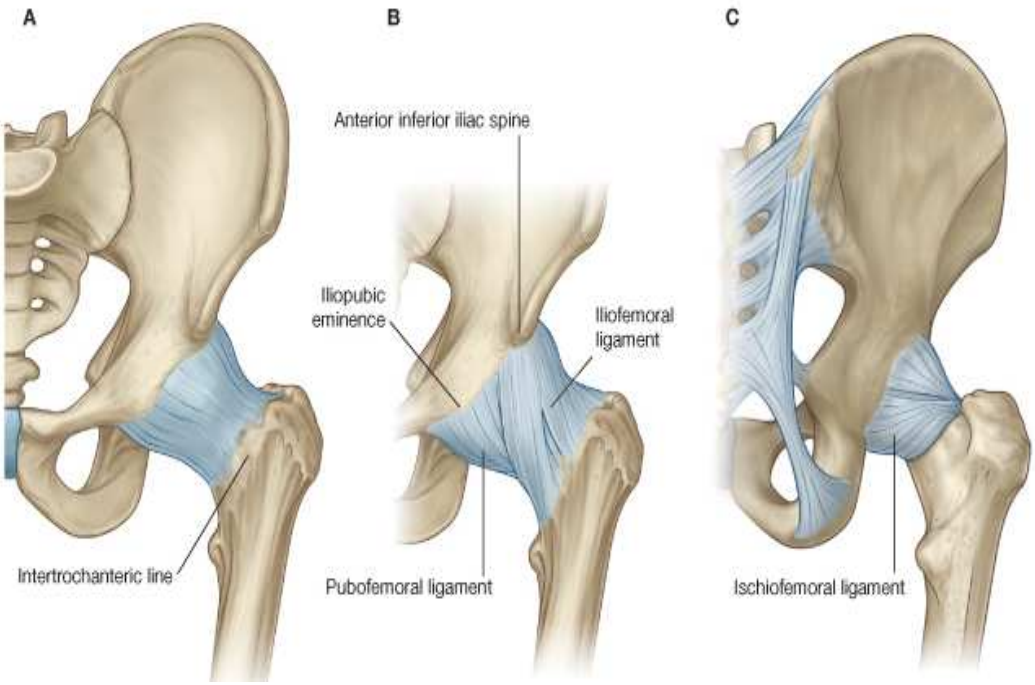
ligamentumteres is inserted. The head of femur with neck is attached to the shaft at an angle of 120 to 130 degrees. The femoral neck is anteverted by 15 to 20 degrees in coronal plane.

Ligaments and Capsule around Hip Joint



Capsule is attached to the hip bone outside the acetabular lip and on the femoral side to the intertrochanteric line anteriorly and 1cm proximal to the intertrochanteric crest posteriorly.

Ileofemoral, Ischiofemoral and Pubofemoral ligaments strengthen the capsule of the Hip joint.



Muscles producing Movements

Groups of Muscles produce movements in Hip Joint in all 3 axes

Flexion (0 – 140 degrees)

Chief Flexor:iliopsoas

Others:tensor fascia lata, sartorius, rectus femoris, pectineus, adductor longus,adductor brevis.

Extension (0 – 20 degrees) by gluteus maximus, hamstrings

Abductions (0 – 40 degrees) by gluteus medius,gluteus minimus

Adduction (0 to 30 degrees) by adductor longus, adductor brevis, adductor magnus,gracilis

External Rotation (0 –45degrees) by short external rotators (superior and inferior gamelli, pyriformis and quadratusfemoris), gluteus maximus

Internal Rotation (0 – 45 degrees) by gluteus minimus, tensor fascia lata

Altered hip anatomy in complex hip cases:

Compromised bony anatomy (femur and acetabulum) and soft tissue structures around hip makes Primary Total Hip Arthroplasty difficult.

HIP DYSPLASIA:

Femoral head may be subluxated or dislocated articulating partially with true acetabulum or false acetabulum respectively. True acetabulum is shallow and weak filled with fibrofattytissue. Femoral neck is excessively anteverted and greater trochanter located posteriorly. Soft tissues around hip contracted.

ANKYLOSED HIPS:

Difficulty is encountered in identifying the joint line of fused hips. Fixed pelvic deformities makes the proper anatomical positioning of cup and femoral stem complicated. Proximal femur may be sclerosed.

PROTRUSIO ACETABULI:

Cavitary defect in medial wall of acetabulum risks perforation while preparing acetabulum.

HIP FRACTURES:

Malunitedacetabular fractures posesacetabular defect and deformity which may need anatomical reconstruction.

NEUROMUSCULAR DISORDERS:

Shallow acetabulum, muscularimbalance, increased neck-shaft angle, excessiveanteversion and soft tissue contractures are associated with neuromuscular disorders.

SKELETAL DYSPLASIA:

Weak hip bones with narrow medullary canal, altered osseous anatomy and coxavaramakes primary replacement.

FAILED OSTEOSNTHESIS:

Previous bony procedures around femur and acetabulum acts as stress risers making subsequent implant fixation insecure.

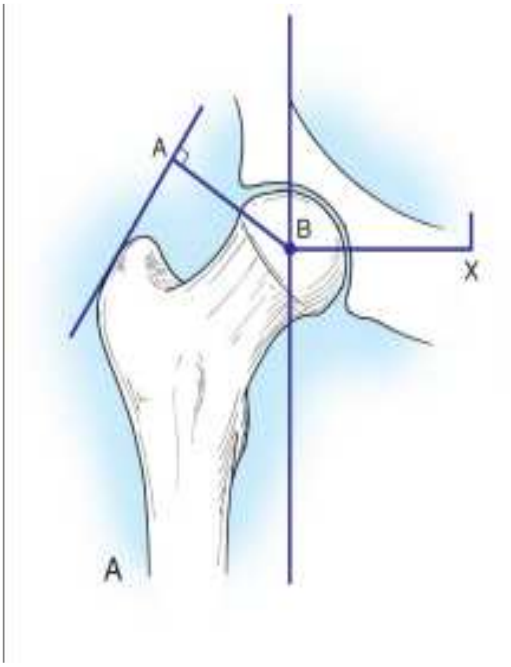
BIOMECHANICS OF HIP JOINT

Total Hip Components once implanted are subjected to repeated bending, compressive, torsional and hoop stresses generated as a result of weight bearing. The natural hip joints can withstand cyclic loading many years without wear. Instead, the artificial components, to resist the cyclic loading (3 – 5 times the body weight) for many years has to be implanted to reproduce the normal anatomical hip joint.

A thorough understanding of the biomechanics of hip joint is a must for performing surgery carefully, avoiding failures post-surgically, selecting proper implant, increasing longevity of prosthesis and tailoring correct designs to fit the patient's anatomy.

FORCES ACTING ON HIP

- BODY WEIGHT-a load applied to a lever arm{BX} spanning frombody's center of gravity to the femoral head’s centre



ABDUCTOR MUSCULATURE- acts lever arm {AB} spanning from lateral aspect of the greater trochanter to the femoral head’s centre

Ratio Lever arm of bodyweight: Lever arm of abductor

BX: AB =2.5: 1

The force of the abductor muscles must approximate 2.5 times the body weight to maintain the pelvis level on single leg stance.

The resultant load on the Femoral Head is the Joint Reaction Force (JRF)

JRF = Body Weight + Abductor Force

= 3 times of BW

=10 times of BW in lifting /running/ jumping

High JRF results due to excess body weight & high physical strain leading to loosening, bending or breaking femoral component.JRF can be decreased by reducing body weight, its moment arm, helping Abductor Force or its moment arm

Abductor Arm is shortened in Arthritis, posterior-lying Trochanter (in external rotational deformity) and Developmental dysplasia of hip

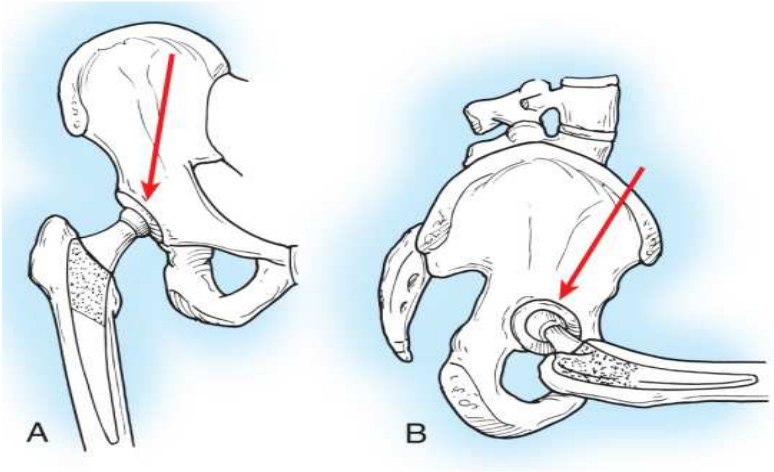
CHARNLEY'S CONCEPT

- Shorten lever arm of the body weight by deepening the acetabulum
- Lengthen the lever arm of the abductor mechanism by reattaching the osteotomized greater trochanter laterally.

Moment produced by the body weight is decreased. So the counterbalancing force that the abductor mechanism must exert is decreased.

Forces on the Hip joint acting in coronal & sagittal planes

Center of Gravity(falls in midline anterior to S2 and posterior to the axis of the joint). It deflects the stem medially(in coronal plane) and posteriorly (in sagittal plane).

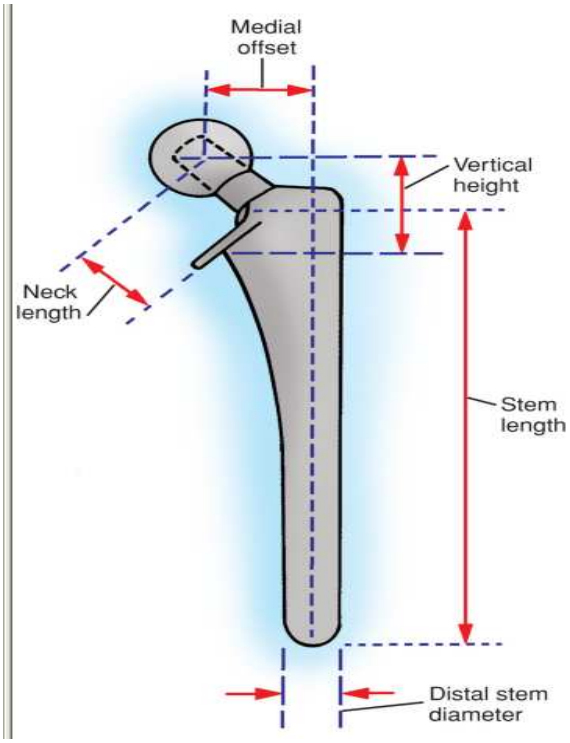


The rotational stability is improved by increased width of proximal portion of stem, rectangular cross section of distal stem and extensive porous coatings

NECK LENGTH & OFFSETS

- Vertical height: distance from LT to centre of head

- Medial offset: distance from center of femoral head to a line through axis of distal part of the stem. It's primarily a function of stem design.



CENTER OF ROTATION OF HIP

JRF is lower in the anatomical location. In superior, lateral and posterior position, there is higher incidence of progressive radiolucencies& migration of components.The restoration of normal center of rotation of femoral head is determined by Vertical offset,Medial offset and Anterior offset(Version of the femoral neck).In THA, inadequate restoration of offset shortens the

moment arm of the abductor musculature resulting in increased joint reaction force.To address individual variations, the components are manufactured with standard & enhanced offset versions; which is accomplished by reducing the neck-stem angle or by attaching the neck to the stem in a more medial position. When Neck is lengthened, Vertical Offset increases. The goal is to achieve proper reconstruction of both features. In modern systems, the neck length (25 to 50 mm) is adjusted by using modular heads.

IMPLANT CHOICES

The Implants for THA are classified on the method of fixation (cemented or uncemented), bearing surfaces (metal on polyethylene, ceramic on ceramic, ceramic on poly, ceramic on metal) and on the basis of design.

FEMORAL STEMS

The femoral stem replaces the femoral head and neck after excising the diseased segment. The fixation can be cemented or uncemented based on the individual's bone quality.

Cemented Femoral Implants

The choices are Composite beam philosophy and Taper slip philosophy. The composite beam depends on perfect bond of cement to the stem by texturing / roughening the surface of the stem whereas the taper slip utilizes polished collarless stem into the cement mantle exploiting the viscoelastic property of the cement. The smooth tapered stems provide predictable long term results.

Implant surface roughness is the average value of peaks and valleys from central line. The stems should occupy 80% of the medullary cross-section. The recommended cement mantle thickness is 4mm

proximally and 2mm distally. A bone or a plastic plug placed 2cm distal to the femoral component acts as a centralizer to provide adequate cement mantle. Practically the cement mantle should occupy 1/3 rd of the medullary canal and remaining 2/3 rd of the femoral stem.

Uncemented Femoral Implants

Failure of the cemented femoral cemented components lead to the development of uncemented femoral components in the mid 70s. The durability of these implants depends upon the geometry, surface finish and the extent of coating.

Geometry – Wedge shaped metaphyseal filling or tapered implants

Extent of coating – proximally or extensively porous coated implants

Surface finish – porous coated or grid blasted

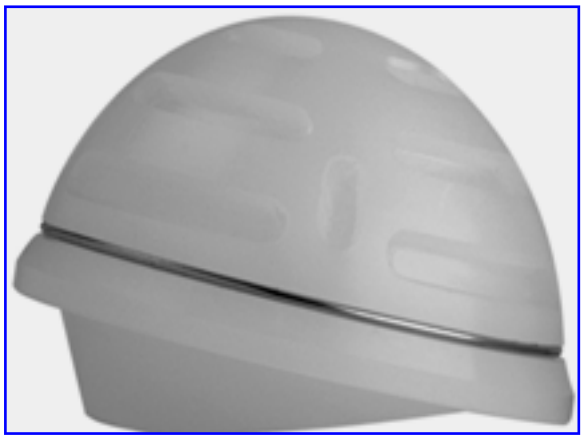
Porous coated defines the metallic surface treated to have to have microscopic pores of varying depths where bone ingrowth occurs. Grid blasted implants with numerous indentations (peaks and valleys) on the surface allows bone ongrowth. The concept of coating femoral stem with hydroxyappetite as a thin layer to improve the osteointegration has revolutionized the uncemented dimension of THA.

ACETABULAR COMPONENT

It can be cemented or uncemented based on the patient's bone quality. The anatomical cup positioning requires anteversion of 10-30 degreed and abduction angle of 40-5- degrees.

Cemented acetabular component – The long term durability of acetabular cups is still debatable. The conventional sockets were thick walled polyethylene cups. The optimum cement mantle of 3mm is achieved by PMMA spacers designed incorporated in acetabular cups. Grooves on the

external surface increases the stability.Cemented fixation is indicated in elderly and sedentary individuals.



Uncementedacetabular component – It could be a press-fit or screw augmentation to fix the cup. It contains a metal outer shell(40 – 75mm) textured on its external surface with either sintered beads, plasma spray, fibred mesh or tantalum to create micropores of 150 – 400nm for better osteointegration. Metal outer shell is upgraded by optional holes for screw fixation, a locking mechanism for inner liner and

accommodationof multiple modular liners with varying offsets, lips, orientations, inner diameter and materials.

The polyethylene inner liner is locked within into the inner shell. The screws are inserted into the postero-superior quadrant to avoid the neurovascular structures. The reconstruction of acetabulum is achieved using specialized acetabularcomponentslike anti-protrusio rings and cages, oblong cups, Burch-Schneider cages.

Bearing Surfaces– The ideal bearing surface in THA should be biocompatible, corrosion and wear resistant.

- Polyethylene: Acetabular cup made of Ultra high molecular weight polyethylene (UHMWPE) is the gold standard till date.

It articulates with a metal or ceramic femoral head. Modern manufacturing techniques lead to highly cross linked ethylene with improved wear rates compared to UHMWPE. Polyethylene as a source of particulate debris produces osteolysis, aseptic loosening of components, is still a challenging problem that leads to failure.

- Metal on Metal (MoM):It's associated with decreased wear rate when compared to polyethylene. Mixed film lubrication is the principal mechanism in MoM hip joints. Larger diameter femoral head can be used to provide good stability and

mobility. Commonly used metal is an alloy of Cobalt and Chromium. The disadvantage of MoM are metal ion hypersensitivity, teratogenic potential and ALVAL(Aseptic Lymphocytic Vasculitis associated Lesions)

- Ceramics: It's a low friction, high-wear resistant and good biocompatible material, made of Alumina / Zirconium. Ceramic had dual options of ceramic on poly or ceramic on ceramic.
- Complications include a squeaking noise, component fracture and stripe wear.The newer version of ceramic on metal has revolutionized the bearing surface concept.

Poly cup

Ceramic cup

Metal cup

COMPLEX HIPS

Complex primary total hip replacement is indicated in the following Cases categorized as complex hips with altered bony and soft tissue anatomy of hip joint.

1. Developmental Dysplasia Hip
2. Ankylosed Hip
3. Protrusioacetabuli
4. Failed Osteosynthesis (previous bony procedures around hip)
5. Skeletal Dysplasia(SED,epiphyseal dysplasia)
6. Neuromuscular disorders(polio, downssyndrome, cerebralpalsy, stroke)
7. Prior hip fractures(acetabular fractures)
8. Severe soft tissue contractures around hip
9. Post excision arthroplasty hip

Disorders of hip joint diagnosed as primary osteoarthritis hip, inflammatoryarthritis (without complications), secondaryosteoarthritis (perthesdisease, avascular necrosis with normal bony anatomy)

CONTRAINDICATIONS FOR SURGERY IN COMPLEX HIPS:

1. Active infection of hip joint-absolute

2. Active infection elsewhere-Dental infections,Systemic infections of Respiratory tract, genitourinarytract, skin and soft tissue are relative contraindications.
3. Progressive neuromuscular disease
4. Neuropathic hip joint

PREOPERATIVE EVALUATION

Clinical examination:

General examination is followed by hip examination in detail. Hip examination includes gait,movements,fixed deformities,limb length and neuromuscular status.Other joint examination is done to rationalize the treatment. Standard hip rating systems like Charnley modified D'Aubigne,Oxford scoring, and Modified Harris Hip evaluation are used to assess the pre and postoperative clinical evaluation.

Radiographic evaluation[1]:

A standard anteroposterior view of pelvis with both hips and lateral view of proximal femur are taken.The radiograph will give an idea of factors like

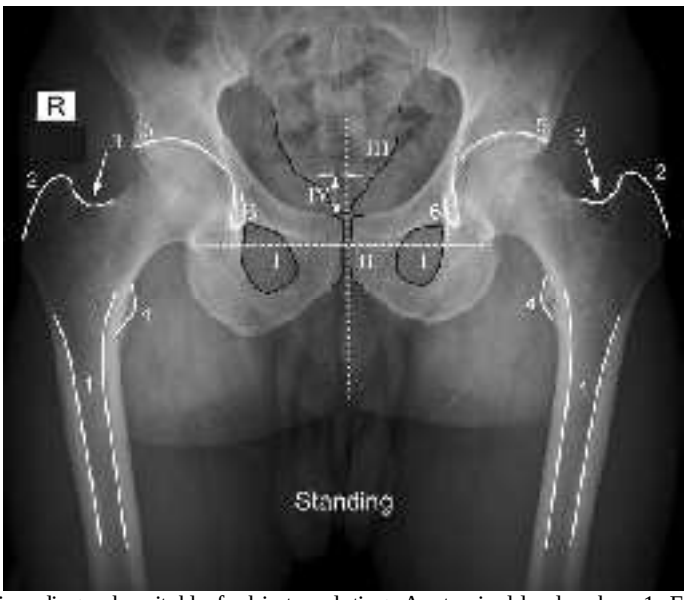
1) Size of the acetabulum and its bone stock(Whether reconstruction with bone graft is required)
2) Degree of Protrusio by drawing Kohlers line.
3) Ankylosed hips showing trabeculae crossing the hip joint.
4) Proximal femur disorders like coxavalga, coxavara, and subluxated / dislocated head. Lateral view of femur

defines abnormal shape,narrow canal requiring small prosthesis.

5) Oblique views of hip for malunitedacetabular fractures to assess the bone stock.
6) Failed osteosynthesis cases reveal implants in situ and altered normal anatomy.
7) CT scan is compulsory in hip dysplasias and malunitedacetabular fractures to know bone stock and quality.

Pre-Operative templating

The purpose of preoperative hip templating is to assess the position and insertion depth of both femoral and acetabularcomponents. Templating gives an idea on potential difficulties expected intraoperatively to reproduce hip biomechanics with the available implants. Preoperative planning recognizes complex hips and appropriate implants, its position to restore anatomical hip joint centre.



Standard anteroposterior pelvic radiograph suitable for hip templating. Anatomical landmarks : 1. Femoral shaft ; 2. Greatertrochanter ; 3. " Saddle" ; 4. Lesser trochanter ; 5. Acetabular roof ; 6. Teardrop. Landmarks for radiographic quality assessment:I.Foramenobturatum; II. Symphysis; III.Sacrum; IV. Distance between symphysis and sacro coccygeal joint

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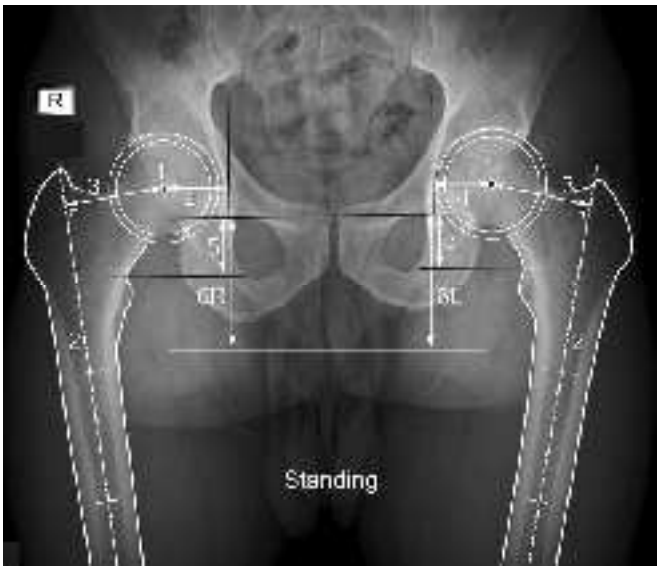

Mechanical landmarks: 1. Hip rotation centre; 2. Longitudinal axis of the proximal femur; 3. Femoral offset; 4. Acetabularoffset; 5. Hip length. 6. The "leg length discrepancy" is calculated as the difference between the distances 6L and 6R

Technique of templating:

Templating x-rays are taken with 15degree internal rotation of affected limb. Acetabular template is placed 5mm inferior and lateral to

tear drop with lateral edge just touching the tear drop. Centre of rotation is marked on acetabular template in 40degree abduction angle. Now femoral templating done to identify the size that fills completely within medullary canal and centre of rotation is marked. Anydiscrepancy (mediolateral or superoinferior) in centre of rotation of femur and acetabular templates gives an idea of femoral offset, neck length required to restore anatomical hip joint centre. In cases with severe deformity where templating is inaccurate opposite hip can be used as reference.

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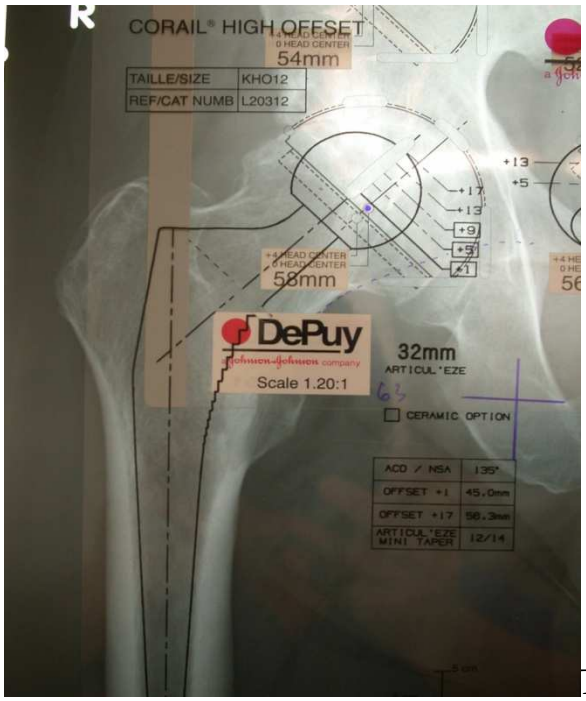
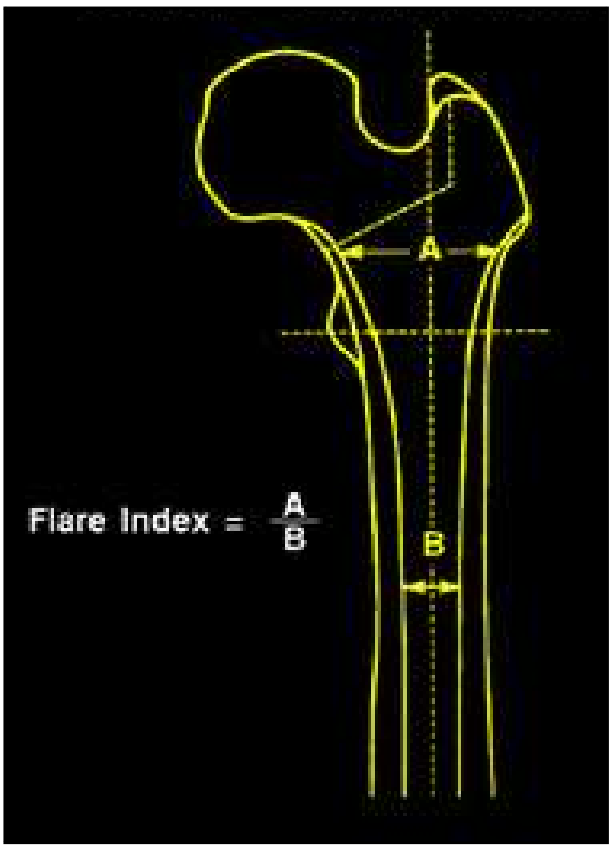
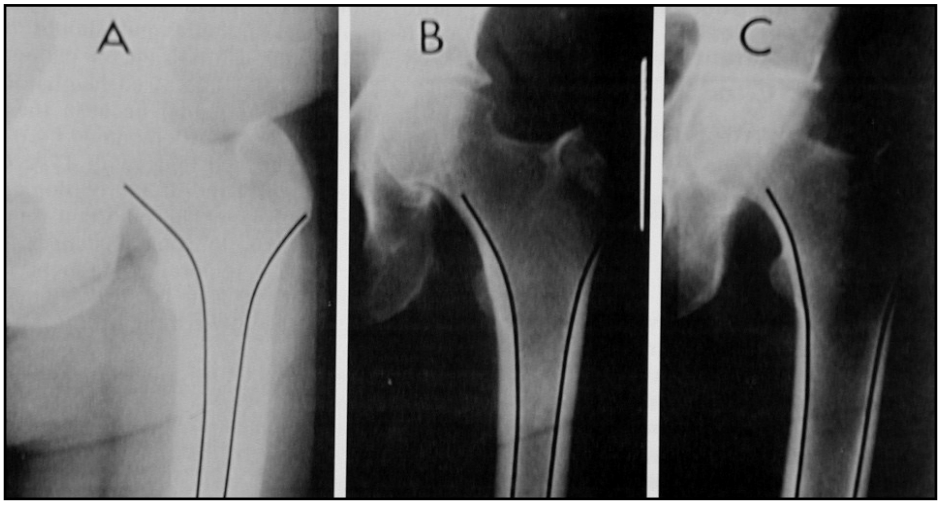


Templating for cementless hips

Cemented or Cementless hips:

Dossick et al categorized femur on Calcar- Canal ratio. A-outer diameter of femur at lesser trochanter level to B-diameter of femur 10cm distal is compared. Dorr classification is an alternate.





A < 0.5(cementless)

B 0.5-0.75 (cemented /cementless)

C>0.75(cemented)

ANAESTHESIA FOR COMPLEX HIPS

The anaesthetist involved in total hip arthroplasty must have a basic knowledge of the surgical procedure so that the anaesthetist is aware of problems (femoral reaming, cementation) during procedure.A thorough preoperative evaluation and workup is necessary.Fibre-optic intubation may be necessary in ankylosing spondylitis. The commonest anaesthesia employed in our study are spinal anaesthesia and epidural anaesthesia.

SURGICAL APPROACHES

The choice of surgical approach for total hip arthroplasty is a matter of surgeons choice and to facilitate orientation so that procedure can be performed properly. The various approaches for hip include

1) Anterior approach

2) Anterolateral Watson and Jones approach

3) TranstrochantericCharnley's approach

4) TransglutealHardinge approach

5) Posterior (Southern Moore) approach

Out of all the anterior, anterolateral and transtrochanteric approaches provides inadequate exposure requiring extensive soft tissue release. The commonly used approach for THA is Hardinge-lateral and posterior approach worldwide.

HARDINGE APPROACH:

Place the patient in lateral position. A posteriorly directed lazy-J shaped incision is made centering the greater trochanter. Divide the fascia lata in line with skin incision.Retract Tensor fascia lata anteriorly and Gluteus

maximus posteriorly.Conjoined tendon (formed by gluteus medius insertion and vastuslateralis origin) is incised obliquely over greater trochanter leaving posterior third of gluteus medius still attached to greater trochanter.Incision is extended 5cm below trochanter in line with vastuslateralis.Anterior portion of conjoined tendon and periosteum of greater trochanter is elevated forwards using sharp chisel.The gluteus minimus tendon is divided and capsule of hip is incised to dislocate hip joint.

POSTERIOR APPROACH:

Southern Moore approach preserves abductor mechanism and is aninternervousplane. Patient in lateral position with knees flexed to relax sciatic nerve incision is made 8cm above and posterior to posterior aspect of trochanter and extended distally along femoral shaft.Gluteus maximus is split along the line of fibres and short external rotators (piriformis, gemelli, and quadratusfemoris) are divided close to its insertion.Exposed capsule incised to view hip joint.

SURGICAL TECHINQUES

After approaching the hip joint either by Hardinge or Posterior approach, the femoral head is dislocated out of the joint socket. Neck osteotomised based on preoperative templating.

Cementless Femoral Component

Reaming done through the Pyriformis fossa of the osteotomised femoral neck until firm cortical reaming is felt. Femoral broaching done sequentially to a point where it is stable axially. Neck cut as determined by pre-operative templating. With trial implants in place, the stability is assessed by Shuck test. Limb length can be altered by varying denominator. Original implants are now inserted.

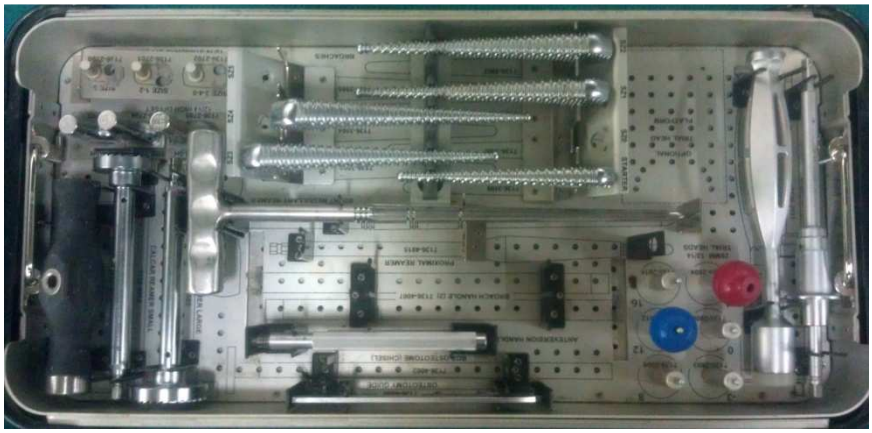
Cemented Femoral Component

Initially medullary canal is identified by tapered reamer. Serial broaching is done in 15 degrees of anteversion, maintaining the axial alignment. Canal preparation is done. In contrast to the cementless stem, excess reaming is avoided. Cement centralizes when introduced 2cm distal to the proposed stem size. Original implants cemented into medullary canal, with cement mantle thickness of 2 – 2.5 mm proximally and 2mm distally.

Implantation of Acetabular components

Acetabulum is exposed all around 360 degrees by complete excision of the labrum. Abnormal osteophytes all around except the superolateral aspect are removed with osteotomes. Reaming of acetabulum is done with 40 degree abduction angle and 15 degrees anteversion. Serial reaming is done till subchondral bone is exposed. Acetabular component is inserted either using a cement or screws in uncemented cups. The safe zone for screws is the posterosuperior quadrant.

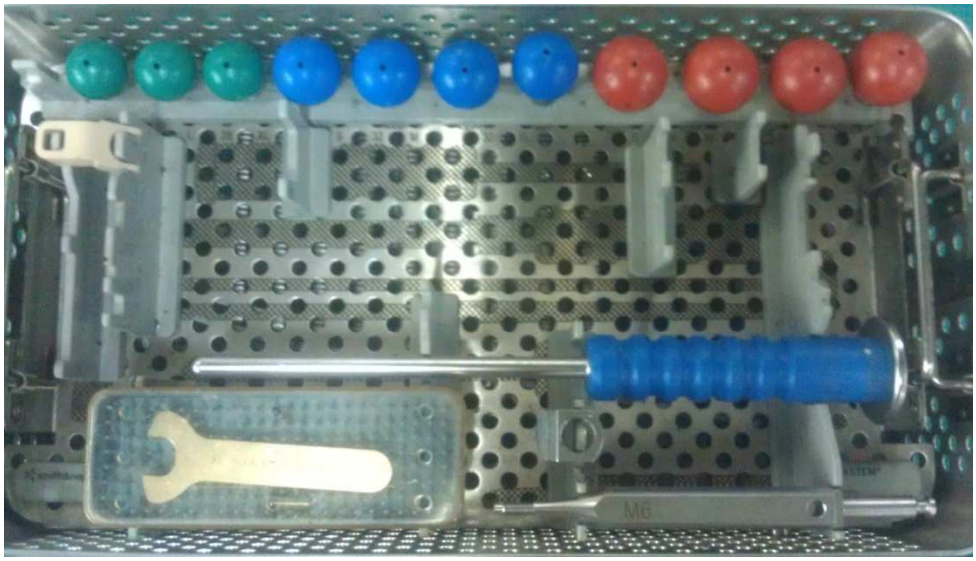
INSTRUMENTS USED IN TOTAL HIP ARTHROPLASTY



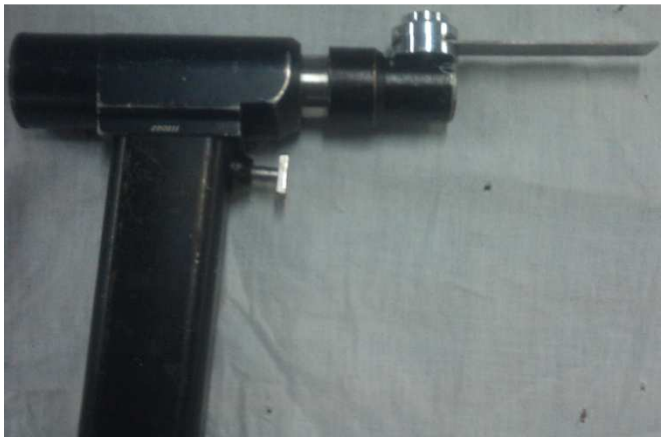
FEMORAL BROACHES

ACETABULAR REAMERS

ACETABULAR TRIAL CUPS



FEMORAL HEAD TRIALS

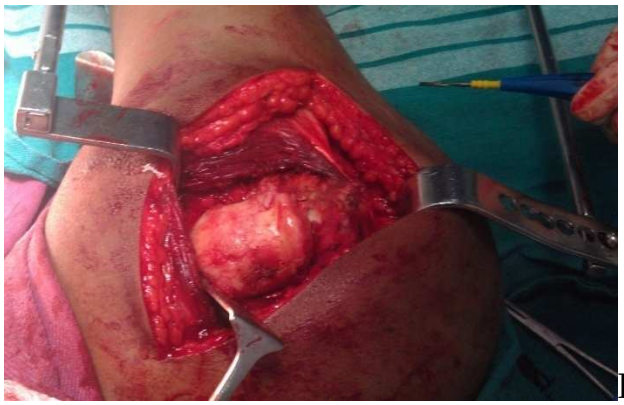


POWER SAW

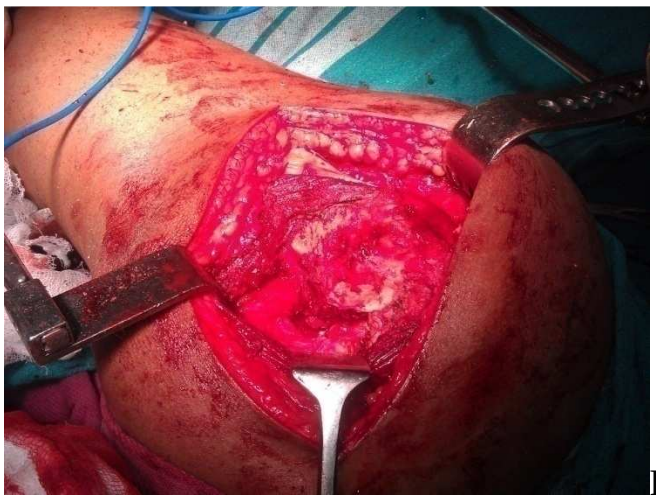
OPERATIVE PHOTOS SHOWING TOTAL HIP ARTHROPLASTY

HARDINGE APPROACH-Lazy J SKIN INCISION

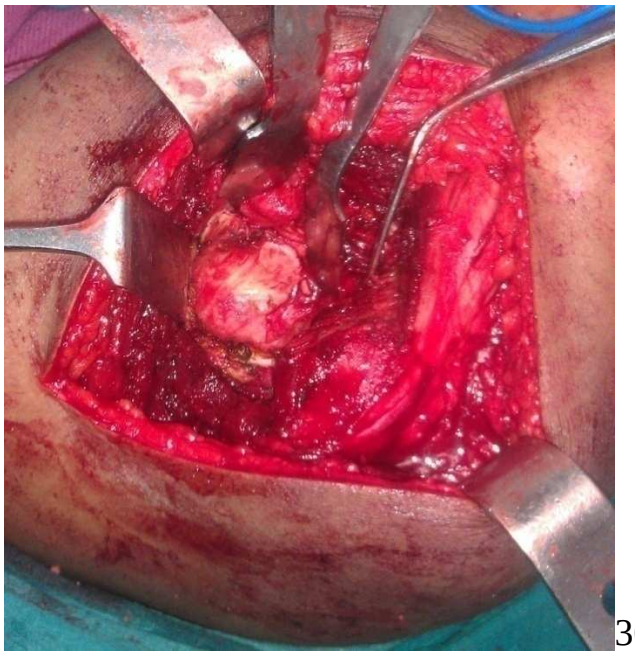
CONJOINED TENDON INCISED&RETRACTED



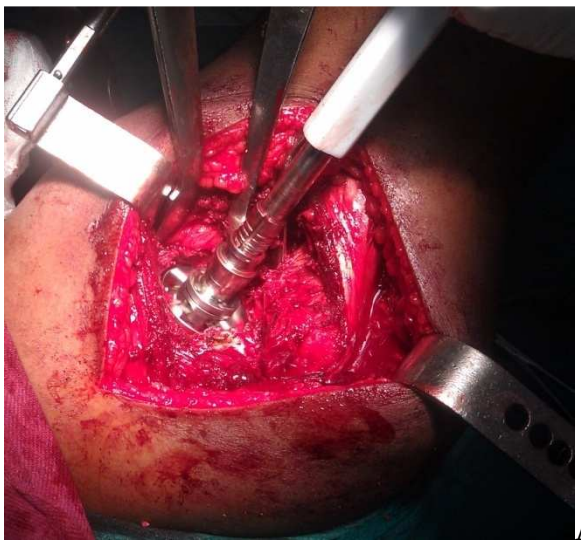
DISLOCATED FEMORAL HEAD



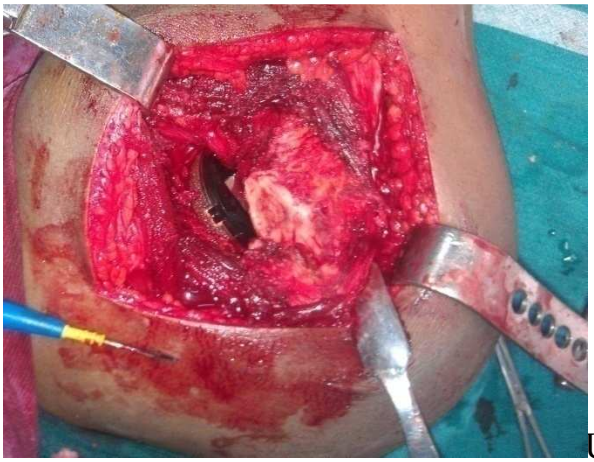
FEMORAL NECK CUT MADE



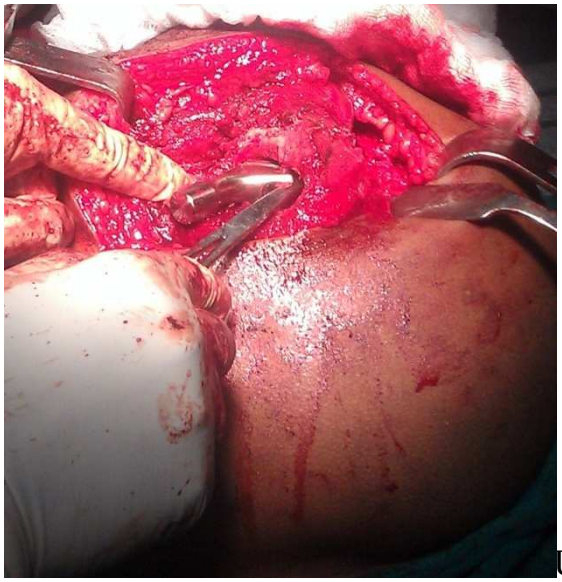
360 DEGREE ACETABULUM EXPOSURE



ACETABULAR REAMING



UNCEMENTED CUP IMPLANTED



UNCEMENTED STEM INSERTED

SURGICAL TECHNIQUES FOR COMPLEX HIP CASES

The surgical techniques employed to restore anatomical hip joint centre is unique to each complex hip cases.

HIP DYSPLASIA[3] :

Crowe's grading system is used to classify dysplastic hips based on femoral head displacement. Dysplastic femur is replaced by small stems.

Grade I <50%

GradeII 50% to 75%

GradeIII 75% to 100%

GradeIV[5]>100%

Acetabular reconstruction – Acetabulum could be hypoplastic,excessively antevertedwith, deficient anterior wall. To restore anatomical hip joint centre several techniques like

- Medialisation-centre of acetabulum placed medially, inferiorly and anteriorly as anatomically possible.
- Cotyloplasty[4] –Controlled fracture of medial wall placing cup medial to Kohlers line augmented with bone graft.

- Roof reconstruction[2] –Femoral head autografts used to augmentsuperolateraldefects, converts rim defects into contained defects.

Reinforcement rings-Protects the structural graft from collapse. BurschSchneidercages or double oblong cups can be used.

PROTRUSIO ACETABULI:

Common causes are Rheumatoid arthritis,ankylosing spondylitis and traumatic in our study group. Kohler's line (ilioischial line) is used as diagnostic criterion to measure the amount of protrusion.

Grade I 1-5mm (mild protrusio)

Grade II 6-15mm (moderate protrusio)

Grade III >15mm (severe protrusion)

In severe cases only peripheral reaming attempted and relies on rim fit. Acetabular component is lateralized by reinforcing the deficient medial wall[17] using following techniques

- Cementing the defect and a cemented socket
- Bone grafting[18] (morcellised) deficient wall followed by cemented/cementless cups

- Metal reinforcement (anti protrusion ring, cages or wire mesh) and cemented cups with bone grafting.

ANKYLOSED HIPS [6, 7, 8, 11, and 12]:

Spontaneous hip fusion is sequelae with tuberculous and pyogenic arthritis, osteoarthritis, trauma, inflammatory arthritis, and ankylosing spondylitis. An in situ femoral neck osteotomy is performed byangling the saw blade in line with the native acetabulum and leaving sufficient quantity of bone in the ilium.The true acetabular cavity is located by 3surgical

Landmarks: the obturator foramen inferiorly, the sciatic notch posteriorly, and the pubic bone or anterior inferior iliac spine anteriorly. During reaming, exposure of pulvinar (fat pad sign) in the medial acetabulum is an indicator of the correct position. A percutaneous adductor tenotomy if the abduction angle is limited (<30°) follows routinely in THA of ankylosed hips.

Malunitedacetabular fractures[16]:

Hip joint arthroplasty following the surgical treatment of acetabular fracture is indicated in patients with post-traumatic hip arthritis associated with surgery for acetabular fractures[15]. The patients can be divided into two different subgroups: the patients with a spherical,

healed acetabulum and the patients with acetabular deformity or defect. The posterior wall fractures with a bony defect of >40%, a structural allograft is required. The principles in reconstruction are

- Restoring hip joint centre anatomically
- Reconstruction of iliopubic and ilioischial columns
- Bone grafting of defects (cavitary / segmental)[14], reconstruction rings/cages.

Minimum of 70 % host bone coverage for cups.

SKELETAL DYSPLASIA AND NEUROMUSCULAR DISEASES[19,20,21]:

Patients who are short stature and dysplastic hip may require small stems with modular implants. Shallowacetabular cavity is managed with smaller acetabular components.Coxavalgain neuromuscular disorders needs femoral component with decreased offset.

SOFT TISSUE CONTRACTURES AROUND HIP:

Fixed deformities of hip due to soft tissue contractures around hip is overcome by extensive release of ilio-psoas, gluteus maximus, adductors, short external rotators and if necessary osteotomy of proximal femur to restore anatomical hip joint centre.

POST EXCISION ARTHROPLASTY HIP:

Conversion of resection arthroplasty to total hip replacement is a challenging task includes release of old scar tissue from proximal femur and ilio-psoas tenotomy. True acetabulum is identified using cotyloid notch as surgical landmark. Deficient bone stock in proximal femur is managed by extensively coated femoral stem.

FAILED OSTEOSYNTHESIS:

Most proximal femoral fractures are successfully treated with internal fixation but a failed surgery can be very distressing for the patient due to pain and disabilityTotal hip arthroplasty is an effective salvage procedure after failed osteosynthesis[22] of hip fractures.

In situ hardware should be assessed during preoperative planning. If the hardware interferes with preparation of the acetabulum and/or femur, one can consider proceeding in 2 stages: an initial first stage to remove hardware followed by a period of approximately 3 months to allow for bony union and soft-tissue healing before performing the definitive procedure.

THA for failed internal fixation for intertrochanteric fractures and intracapsular neck fracture in our cases were managed by closing screw hole gaps manually using thumb.

COMPLICATIONS AND ITS MANAGEMENT

Complications are categorized into early and late based on duration following total hip arthroplasty.

COMPLICATIONS

EARLY	LATE
Nerve injury Vascular injury Hematoma Deep vein thrombosis Infection Limb length discrepancy Dislocation	Loosening of implants Infection Periprosthetic fractures Heterotopic ossification

Nerve injuries:

The nerve injuries following total hip arthroplasty has an incidence of 0.7-3.5%.Nerves at risk are sciatic, femoral and obturatornerves. The causes are surgical trauma, tractioninjury, limb lengthening, or thermal injury from bone cement. Limb lengthening of greater than 4cm risks sciatic nerve injury. Nerve palsy due to hematoma needs immediate exploration and decompression for better results.

VASCULAR INJURIES:

The placement of anterior retractor should have a blunt tip and release of anterior capsule should be meticulous to avoid vascular insult. Removal of soft tissue from inferior acetabulum risks obturatorartery. The penetration of medial wall of acetabulum or cement extrusion can damage common iliac artery/superficial iliac vein. The incidence of vascular injury is 0.2-0.3% in primary THA.

HAEMATOMA:

Careful haemostasis, use of suction drain and bone wax (bleeding surfaces) can avoid haematoma. Patients on anti-coagulants are monitored carefully. Ifhaematoma is found immediately drained to prevent infection.

DEEP VEIN THROMBOSIS:

Apart from major hip surgery sedentary life style, obesity, immobility and old age are co morbid conditions that increase DVT incidence.DVT leading to pulmonary embolism is a dreaded complication sometimes causing death. Of all Orthopaedic procedures 50% DVT occurs following total hip arthroplasty. Calfveins, iliofemoral veins are common sites of thrombosis. Diagnosis is made using venography / duplex. Prophylaxis for DVT includes early mobilization, intermittent pneumatic compression/elastic stockings, drugs (LMW

Heparin 5000IU SC 2hrs prior to surgery followed by 8hrly postoperative period).Established DVT is treated by Heparin infusion, thrombolysis, thrombectomy and IVC filters.

LIMB LENGTH DISCREPANCY:

Inspite of proper preoperative planning, templating, sophisticated instruments and modular implants limb length discrepancy is invariably present in all cases even at experienced hands. Most often it is the lengthening that results due to soft tissue release. The following recommendations are followed to avoid discrepancies.

I. Charnley measured limb length from anterior superior iliac spine to fixed landmark and reproduced it during trial reduction.

II.Amsutz- a pin is placed at superior border of acetabulum and distance is measured from cut surface of femoral neck. This is used as reference line.

III.Muller-Anatomical femoral head centre corresponds to tip of trochanter and according to this neck cut is made.

IV.Level of neck resection alters limb length.

DISLOCATION AND SUBLUXATION:

Incidence of dislocation is 3% and it is more in revision cases. The major causative factor is component malposition and soft

tissue tension. The safe range of cup orientation is 30-50degrees abduction angle and 5-25degrees anteversion. Vertical cup inclination results in subluxation / dislocation of hip on mild adduction. Horizontal cup creates impingement and posterior dislocation. Femoral anteversion is normal 5-15 degrees. Excessive anteversion of neck/cup causes anterior dislocation and increased retroversion results in posterior dislocation. Other factors causing dislocation are

Excessive bone cement and large osteophytes impinges neck leading to dislocation. Protrusio with greater trochanter impingement on abduction, shortneck, varusstem, posterior approach and revision surgeries are other risk factors for dislocation.

Most dislocations occur within first 6wks especially in immediate postoperative period. Closed reduction with traction/abduction relocates hip joint and patients are kept in 15degree abduction with derotation bar and rest for 2wks.Late dislocations can be reduced in 50% cases by closed methods and rest of cases needs revision surgery.

ECTOPIC (HETEROTOPIC) OSSIFICATION:

Postoperative heterotopic ossification is radiologically seen as ill-defined,hazy density in early stages followed by calcification in 3-4wks

in late stages. Calcification matures to bone after 1-2yrs.Extensive soft tissue dissection and anterior / anterolateral approaches are frequently associated with ectopic ossification.THA for Pagets disease, DISH, Ankylosing spondylitis are at high risk. Prophylactic postoperative radiation of 700-800rads or NSAIDS/ Indomethacin for 6wks.Excision of mass is done in established case.

PERIPROSTHETIC FRACTURES:

Fractures of femur and acetabulum while preparation is a dangerous complication to treat. Vancouver classified it as type A - fracture of proximal metaphysic. type B-fracture of proximal diaphysis and type C-fracture at or distal to stem tip. Type A treated conservatively whereas type B,C needs surgical intervention.

LOOSENING OF COMPONENTS:

Osteolysis is a major long term complication of THA.It develops and progresses asymptomatically.Osteolysis is due to phagocytosis of wear particles leading to activation of inflammatory cells and recruitment of osteoclasts. In cemented hips, the acetabular component is associated with loosening in contrast to hips where the femoral component is loosened. Radiographic analysis of loosening is done by the following methods

- Acetabular component loosening :radiolucent zones around acetabular cups are classified into Zones 1, 2 and 3 (from lateral to medial) by Delee and Charnley. The acetabular component is considered loose if there is more than 2mm radioluscency in all 3 zones, progressive radioluscency in zone 1 and 2, change in component position, protrusion as described by Garrold et Al.
- Femoral component loosening : Aseptic loosening of femoral components is a major complication since the length of the follow up increases. The artificial joint subject to varying stress forces around hip for a long time results in wear and tear leading to loosening.

The 4 modes of cemented femoral stem loosening are pistoning behavior, medial stem pivot, calcar pivot and cantilever bending. Gruen described 7 zones for cemented femoral component loosening from lateral to medial.

The methods employed to avoid component loosening are

1) 3rd generation cementing techniques like vacuum mixing
2) Use of centralizer to produce uniform cement mantle for femoral stem and spikes / spacers for acetabular component
3) Pressurization of cement

INFECTION

Post operative infection in THA is usually a catastrophic complication. The important issue in management of deep infections is prevention. The infection is difficult to eradicate due to the growth of the bacteria in the biofilm on the implants. The incidence is 1-2% worldwide , which can be decreased by prophylactic antibiotics, laminar airflow, space suits and ultraclean theatres. Preoperative evaluation of infective foci anywhere else in the body (dental caries , urinary tract infection, respiratory tract infection etc) is treated prior to the procedure. Infection is THA is classifies by Charnley into early and late. The most common organisms reported in large series are staphylococcus followed by streptococcus and pseudomonas. The radiographic signs of infection can be loosening of components, end steal scalloping or entire bone erosion around the cement mass. Gallium-67 bone scan,Iridium -111 bone scan are more specific for infection. Infection is managed by 1)Antibiotic therapy 2)Surgical debridement 3)Removal of prosthesis and resection arthroplasty 4)Resection arthroplasty with one or two stage revision.

MATERIALS AND METHODS

STUDY DESIGN

A retrospective and prospective study was done to evaluate the functional outcome in 30 patients who underwent complex primary Total Hip replacement and to analyze the results.

STUDY GROUP:

The study group consists of 30 Patients who underwentcomplex primary Total Hip replacement between Jan 2009 and Dec 2012 at the Institute of Orthopaedics and Traumatology , Madras Medical College and Government General Hospital , Chennai. The study was done with clearance from Hospital ethical committee. Those who fulfilled the inclusion criteria given below, were invited to participate in the study. Informed consent was obtained from all the patients willing to take part in the study

a. **INCLUSION CRITERIA:**

1)Developmental Dysplasia Hip

2) Ankylosed Hip

3) Protrusioacetabuli

4) Failed Osteosynthesis (previous bony procedures around hip)

5) Skeletal Dysplasia(SED,epiphyseal dysplasia)

6) Neuromuscular disorders(polio,down'ssyndrome, cerebralpalsy, stroke)

7) Prior hip fractures(acetabular fractures)

8) Severe soft tissue contractures around hip

b. **EXCLUSION CRITERIA:**

1) Primary osteoarthritis hip

2) Inflammatory arthritis without complications

3) Secondary arthritis (avascular necrosis, perthes disease)

METHODS:

The recording of data begins on admission of patient and continues for 2 years postoperatively. The protocol for our study is

1) Pre-operative clinical proforma
2) Pre-operative Xray pelvis with both hips- AP and lateral view, special views
3) Operative proforma
4) Complications proforma

5) Postoperative Xrays
6) Monthly follow up for 1st 4 months, once in 6months upto 2 years and yearly thereafter

PRE-OPERATIVE EVALUATION:

A detailed clinical examination and radiological assessment[1] was done to assess the nature of deformity, bone stock, functional impairment and component sizes. Pre-operative templating is routinely done in all cases.Pre-operative clinical evaluation was done using Modified Harris Hip Scoring.

HARRIS HIP SCORE (MODIFIED)

Pain *(check one)*
□None or ignores it (44)
□Slight, occasional, no compromise in activities (40)
□Mild pain, no effect on average activities, rarely moderate pain with unusual activity; may take aspirin (30)
□Moderate Pain, tolerable but makes concession to pain. Some limitation of ordinary activity or work. May requireoccasional pain medication stronger than aspirin (20)
□Marked pain, serious limitation of activities (10)
□Totally disabled, crippled, pain in bed, bedridden (0)

Limp
□None (11)
□Slight (8)
□Moderate (5)
□Severe (0)

Support

□None (11)
□Cane for long walks (7)
□Cane most of time (5)
□One crutch (3)
□Two canes (2)
□Two crutches or not able to walk (0)

Distance Walked
□Unlimited (11)
□Six blocks (8)
□Two or three blocks (5)
□Indoors only (2)
□Bed and chair only (0)

Stairs
□Normally without using a railing (4)
□Normally using a railing (2)
□In any manner (1)
□Unable to do stairs (0)

Put on Shoes and Socks
□With ease (4)
□With difficulty (2)
□Unable (0)

Sitting
□Comfortably in ordinary chair for one hour (5)
□On a high chair for 30 minutes (3)
□Unable to sit comfortably in any chair (0)

Enter public transportation
□Yes (1)
□No (0)

Flexion Contracture: _____ degrees

Leg length discrepancy: _____cm

Absence of Deformity (All yes = 4; Less than 4 =0)
Less than 30° fixed flexion contracture □Yes □No
Less than 10° fixed abduction □Yes □No
Less than 10° fixed internal rotation in extension □Yes □No
Limb length discrepancy less than 3.2 cm □Yes □No

RANGE OF MOTION (INDICATES NORMAL)***
Flexion (*140°) _____
Abduction (*40°)_____
Adduction (*40°) _____
External Rotation (*40°) _____
Internal Rotation (*40°) _____
Range of Motion Scale
211° - 300° (5)
161° - 210° (4)
101° - 160° (3)
61° - 100 (2)
31° - 60° (1)
0° - 30° (0)
Range of Motion Score _____

Total Harris Hip Score _____ (max 100)

System ofgrading of patients:

The results were evaluated using Harris Hip Scoring

Max Points: 100

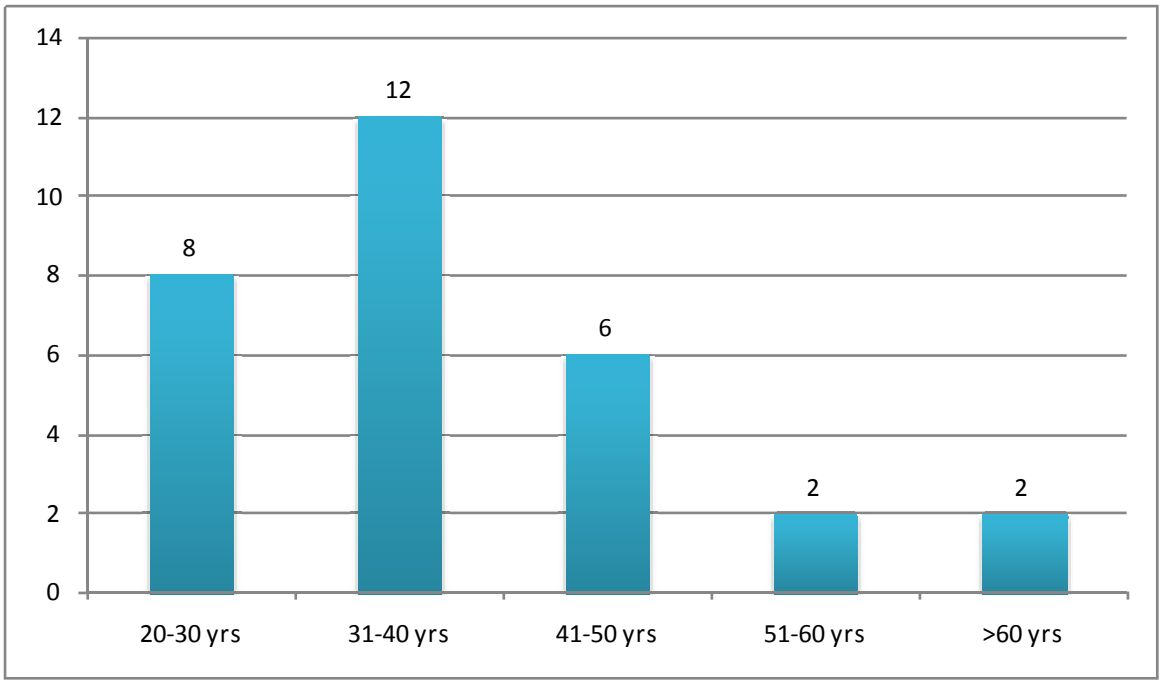
Excellent: 90 - 100

Good: 80 – 89

Fair: 70 – 79

Poor: less than 70

AGE INCIDENCE AND DISTRIBUTION



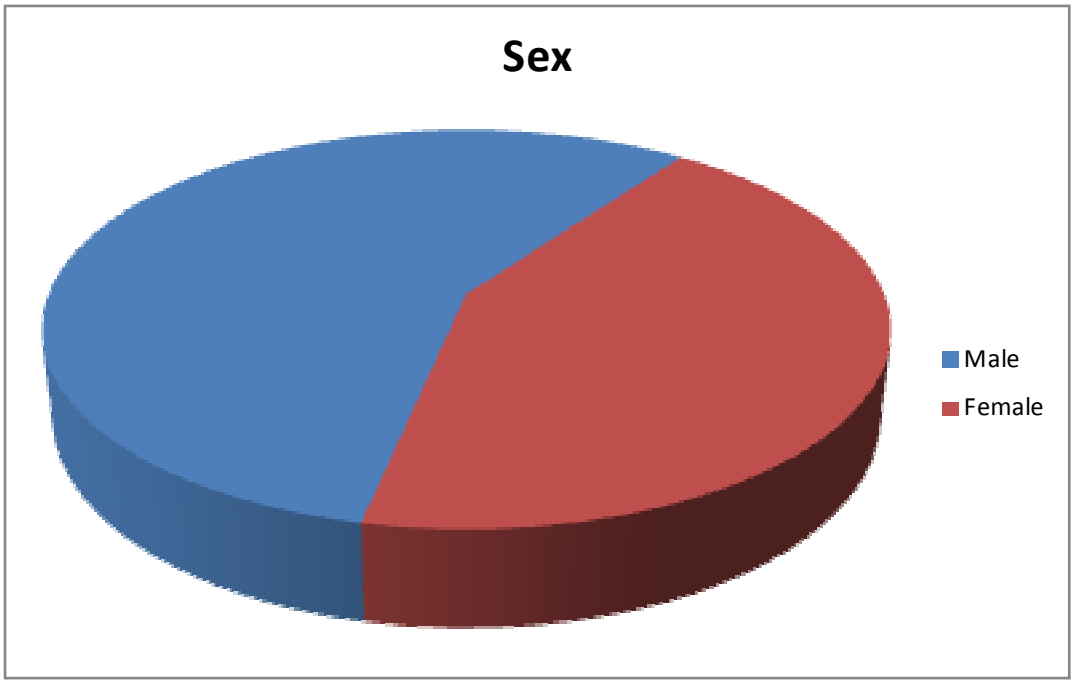
Age	No of Patients	Percentage
20 to 30 Years	8	26.67%
31 to 40 Years	12	40%
41 to 50 Years	6	20%
51to 60 years	2	6.67%
>60 years	2	6.67%

The Mean age of the patients was 38years ranging from 20 to 65 years.

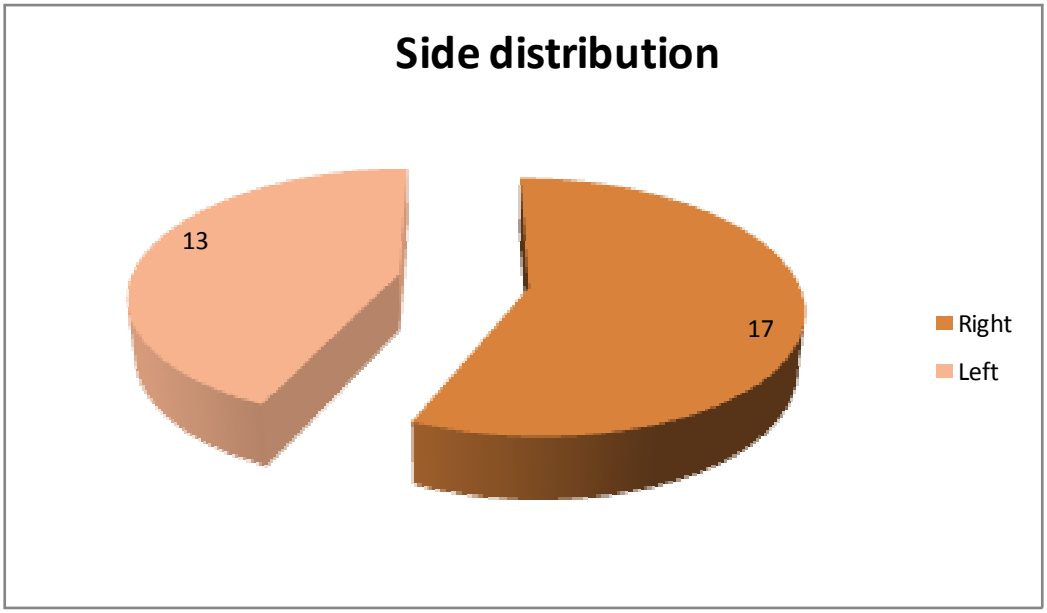
SEX INCIDENCE:

Males dominated in our study Male: Female ratio was 2:1 (20:10)

17patients (56.6%) had been operated on right hip and 13(44.4%) patients had on left side.



SIDE DISTRIBUTION:



ANAESTHESIA:

In our series of 30patients Spinalanaesthesia is given for 20 patients and Epidural anaesthesia for 10 patients. All the cases went on uneventfully without anaesthetic complications preoperatively and postoperatively.

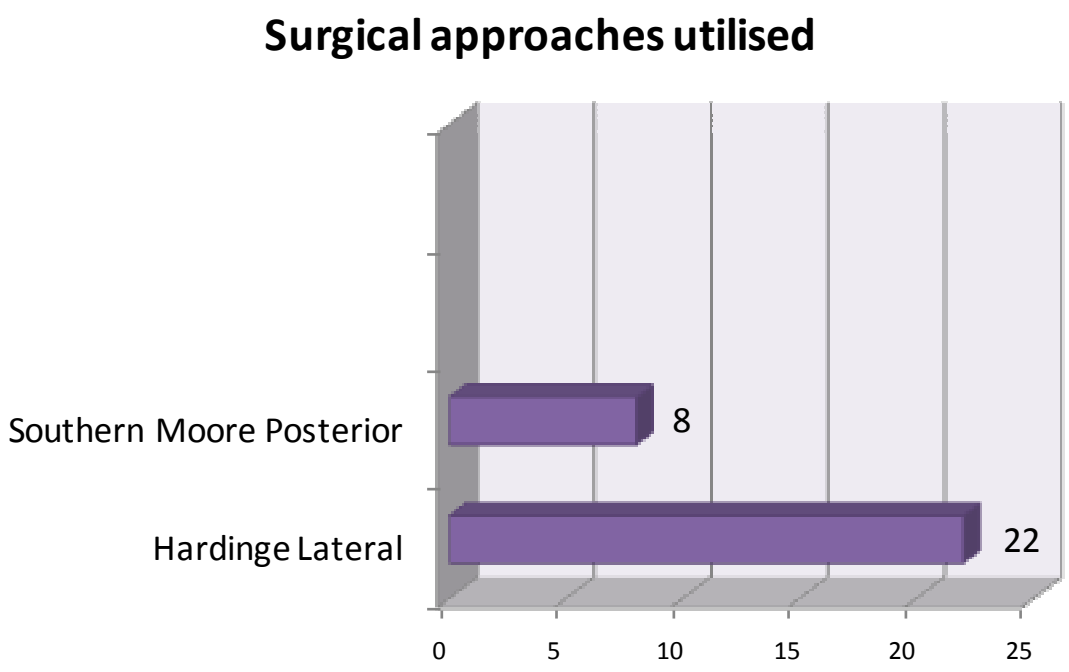
Spinal anaesthesia------20 cases

Epidural anaesthesia---10 cases

SURGICAL APPROACHES:

We used Hardinge lateral approach in 22 of our cases (73.33%) and Southern Moore posterior approach for 8 cases (26.67%).

Approach	No. of Patients
Hardinge Lateral	22
Southern Moore	8



Complex Hip categories

A:Protrusioacetabuli

B: Hip dysplasia

C:Malunited Fracture Acetabulum

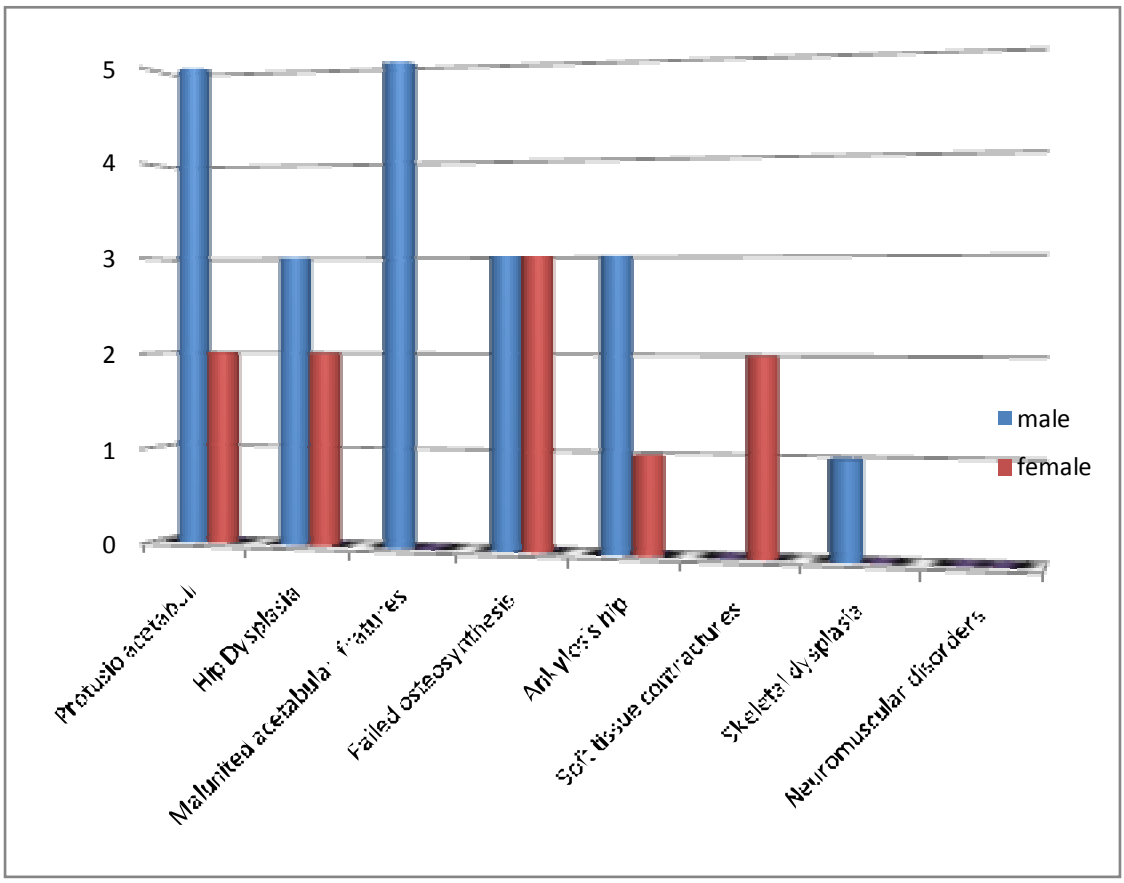
D: Failed Osteosynthesis

E:Ankylosed Hips

F: Soft tissue contractures

G: Skeletal dysplasias

H: Neuromuscular disorders



IMPLANTS USED

Total 30 hip replacement done in thirty different individuals. Out of 30 cases 20 were and 10 were cemented. The implants used wereUncemented THA - Corail stem, Metal head, Duraloc metal cups with highly crosslinked polyethylene

Cemented THA - Standard Charnley design C-stem, metal head on Polyethylene cups

Special designs - Acetabular reconstruction rings, Anti protrusion cages, DDH small stem design, S-ROM, Jumbo cups

Cement – Polymethlymethaacrylate cement of standard viscosity like Simplex, Palacos, CMW 1 & 2 were used.

POSTOPERATIVE PROTOCOL

In all cases, prophylactic intravenous antibiotics started with the night before surgery and 3 doses postoperatively. The postoperative management varies for each case of complex hips based on the procedure done. Drain removal done at 48hrsand Postoperative Xray Pelvis with both hips- AP is taken. DVT prophylaxis is administered to vulnerable cases. Postoperative rehabilitation is as follows

1) Active and Passive mobilization on first POD
2) Complex Cemented THA full weight bearing from day2 as tolerated by the individual, with or without crutches
3) Rest the limb in abduction and avoid hyperflexion
4) Routine breathing exercises and static quadriceps, gluteal exercises
5) Complex Uncemented THA, nonweight walking with support for 6weeks followed by partial weight bearing for 3 months and full weight thereafter
6) Physiologically Older patients may require walking stick life long
7) Monthly follow up for 1st 4 months, once in 6months upto 2 years and yearly thereafter
8) Post operative Harris Hip Scoring to evaluate the Clinical and Functional outcome

OBSERVATION AND RESULTS

The following observations were made in our study

The Mean age of the patients was 38 years ranging from 20 to 65 years? Nearly 27% patients belong to 3rd decade followed by 4th decade (40%). 87% of the patients belong to less than 50 years.

Males dominated our study group with a ratio of 2: 1

Most of the patient was operated by Hardinge Lateral approach (22 Patients). 8 patients were operated by Posterior Southern-Moore approach.In our study the average surgical time delay was 6 days ranging from 5 to 17 days.

The average surgical time was 120 minutes ranging from 60 minutes to 3 hours.

Complications encountered in our study were hip dislocation, superficial infection, limb length discrepancy, acetabular bone graft resorption, heterotopic ossification andsubsidience of femoral stem(uncemented).

One patient dislocated in the immediate post-operative period; which was reduced instantly under anaesthesia by traction and abduction.

One patient developed superficial infection treated with broad-spectrum antiobiotic 3rd generation cephalosporin ceftriaxone with amikacin and metronidazole. Patient recovered in 5 days with well healed wound.

15 patients developed limb length discrepancies averaging 0.9cm (ranging from 0.5cm to 1.5cm). Some patients were treated conservatively while others were treated by heel and sole rise.

Two patients had acetabular bone graft resorption. Both are still being observed for implant loosening.

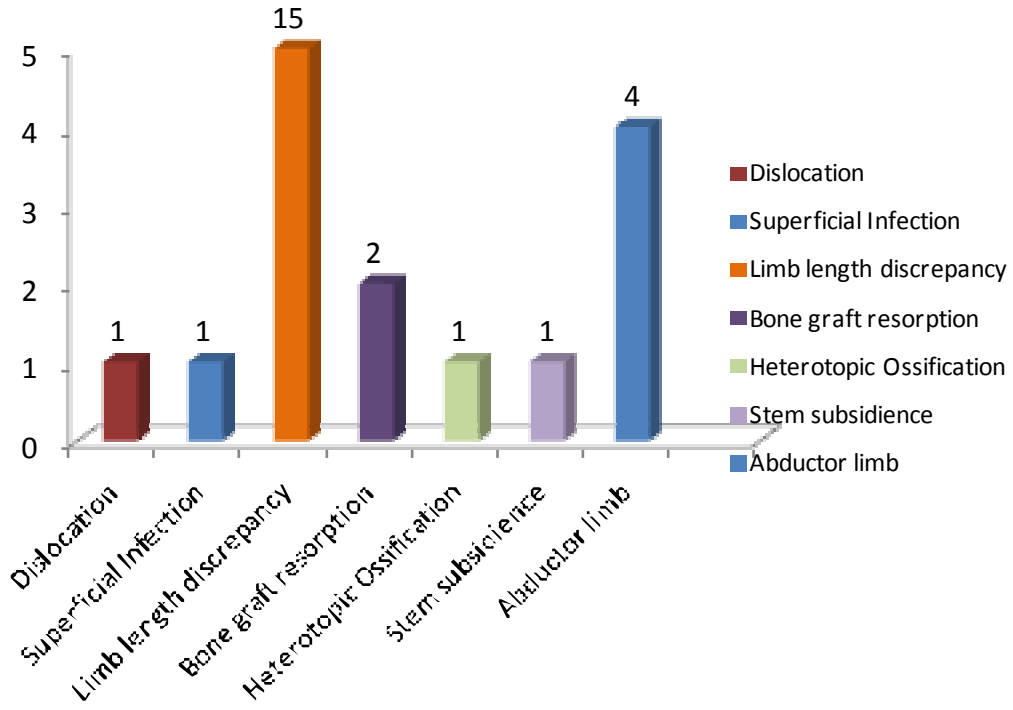
One patient was diagnosed withheterotopic ossification that was treated with Indomethacin 75mg OD for 6 weeks.

One patient developed Subsidience of femoral stem (uncemented) which required revision of Femoral stem alone

Our follow up ranges from a minimum of a month to a maximum of 4years

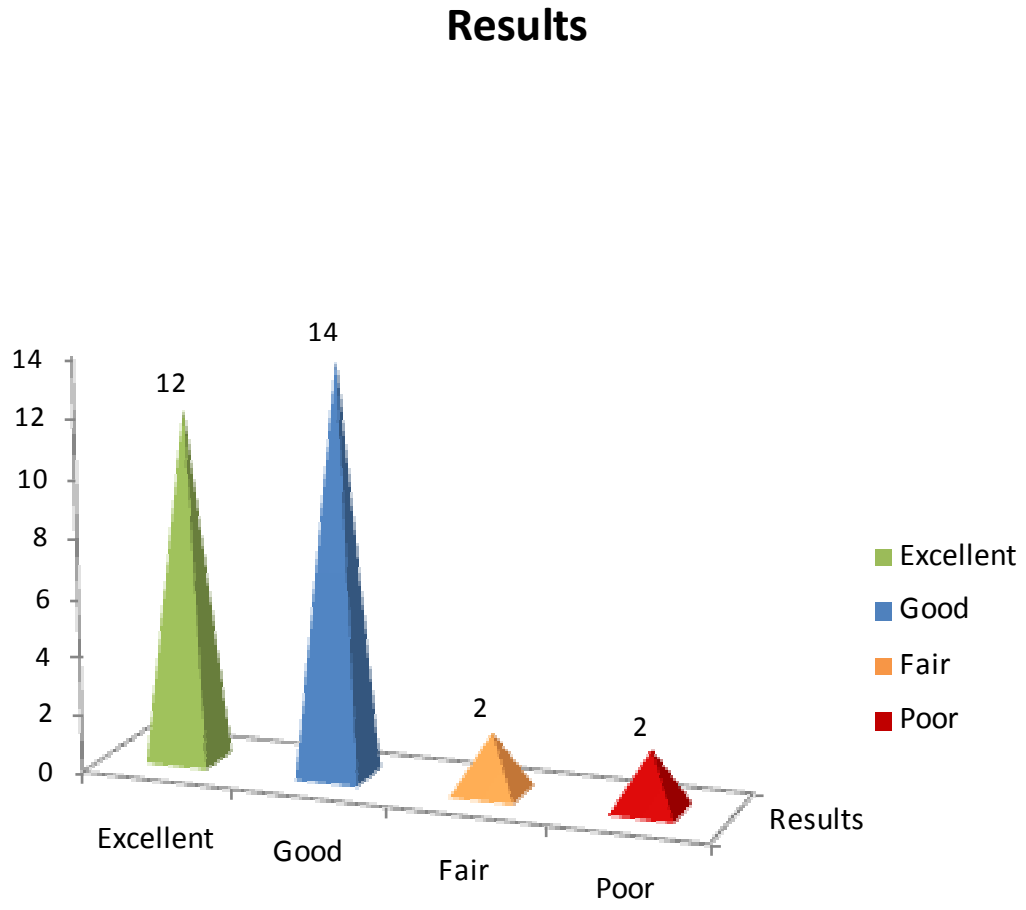
Averaging 24months.

Complications



RESULTS

In our series of 30 patients operated on complex hips, we bring forward the following results



CASE ILLUSTRATION

CASE ILLUSTRATIONS

CASE 1

NAME:Jaganathan IP NO: 30548

AGE: 37yr

Diagnosis: Rheumatoid Arthritis with Protrusio (R) Hip

PROCEDURE DONE: Uncemented THA

TECHNIQUE:acetabular cup lateralized by impacting morcellized bone grafting into the medial wall

FEMORAL COMPONENT	8sized Corail stem, 28mm +0 femoral head
ACETABULAR COMPONENT	52mm duraloc metal shell with poly liner
HARRIS HIP SCORE	92
FUNCTIONAL OUTCOME	Excellent

CASE 2

NAME: Kumar IP NO: 113247

AGE: 40 yr

Diagnosis: Old malunited # Acetabulum (L) with Implant insitu

PROCEDURE DONE: Uncemented THA

COMPLICATION: Superficial infection treated with 3rd generation Cephalosporins

FEMORAL COMPONENT	2sized stem, 28mm + 0 femoral head
ACETABULAR COMPONENT	54mm metal shell with poly liner 20 degree hooded
HARRIS HIP SCORE FUNCTIONAL OUTCOME	91 Excellent

CASE 3

NAME:Kuppusami IP NO: 115484

AGE: 40yr

Diagnosis: Ankylosed (R) Hip

PROCEDURE DONE: Uncemented THA

TECHNIQUE:Insitu femoral neck osteotomy done.Acetabular cup identified by fat pad sign, Bone graft augmentation of superolateral defect.

FEMORAL COMPONENT	2sized stem, 28mm + 0 femoral head
ACETABULAR COMPONENT	52mm metal shell with poly liner 20 degree hooded
HARRIS HIP SCORE	84
FUNCTIONAL OUTCOME	Good

CASE 4

NAME:Raji IP NO: 23814

AGE: 31yrs/M

Diagnosis: Old central fracture dislocation (L) hip, Protrusio (L) hip with secondary osteoarthritis.

PROCEDURE DONE: Hybrid THA Cementedcup, Uncemented Stem

TECHNIQUE:Insitu femoral neck osteotomy, Bone grafting with Antiprotrusio cage

FEMORAL COMPONENT	2sized stem, 28mm + 0 femoral head
ACETABULAR COMPONENT	52mm metal shell with poly liner 20 degree hooded
HARRIS HIP SCORE	88
FUNCTIONAL OUTCOME	Good

DISCUSSION

The surgical techniques used in the complex primary THA to restore the anatomical hip joint centre, has given satisfactory results which is comparable with literature worldwide.

In our series of 30 cases, 22 were operated using Hardinge Lateral approach and 8 cases were done with Posterior approach. Our study showed lateral approach to be superior without complications and a case of post operative dislocation in a patient operated through posterior approach.

On dissecting our case study, the 7 cases of Protrusio acetabuli,5 cases of Hip dysplasia, 6 cases of Failed Osteosynthesis, 2 cases of Soft tissue contractures and 1 case of Skeletal dysplasias went on uneventfully with good outcome with excellent and good results. The complications were mainly restricted to Malunited Fracture Acetabulum and Ankylosed Hips.

Role of Preoperative Templating

In Our study, all cases were template preoperatively on standard 100% magnified AP Xray. Templating reduced the operative time, widened the idea on various implant choices (required in complex hips), restored the anatomical hip joint centre and finally reduced the complication.

ProtrusioAcetabuli;

In our series of 7 cases, 6 were treated with morcellized bone grafting (impaction grafting) and one was treated with anti-protrusio cages. All 7 cases underwent uncemented THA and postoperatively uneventful except for limb-length discrepancy in 2cases. Our study results using Harris Hip Score gave 100% excellent results compared to results of The Journal of Arthroplasty Volume 22, Issue 8 , Pages 1143-1149, December 2007 by DrArunMullaji, who reported 90% excellent to good results in his study.

Malunitedacetabular fractures

In our series of 5 cases, 2 were treated with bulk autogenous bone grafting for reconstruction of the acetabulum. Among 5 cases, 3 cases underwent uncementedTHA while 2 underwent cemented THA and postoperatively complicated by bone graft resorption in 1 case and limb-length discrepancy in 3 cases. Our study results using Harris Hip Score gave 80% excellent to good results, which is comparable to results of Weber et Al ; THA after operative treatment of acetabular fracture JBJS AM 1998: 80 : 1295-1305 and Bellabarba JBJS AM 2001 ; 83-A(6) 868-876

Hip Dysplasia

In our series of 5 cases, 2 were in need of acetabular reconstruction using bulk autograft. All 5 cases underwent uncemented THA which were complicated by limb length discrepancy in 2 cases. Our study results using Harris Hip Score gave 100% excellent to good results better than the results published by Obayashi S et Al. Total hip arthroplasty with bulk femoral head autograft for acetabular reconstruction in DDH. Surgical technique.*J Bone Joint Surg Am.* 2004;86(suppl 1):11-17; Papachristou G et al. Total hip arthroplasty for developmental hip dysplasia. *IntOrthop.* 2006;30(1):21-25.

Ankylosed Hips

In our series of 4 cases, all cases underwent uncemented THA. Our study results using Harris Hip Score gave 25% good, 50% fair and 25% worse results which is disastrous when compared to results of Joshi AB et Al ; Conversion of a fused hip to total hip arthroplasty. *J Bone Joint Surg Am.* 2002;84-A(8):1335-1341.

; Hamadouche M at al Total hip arthroplasty for the treatment of ankylosed hips: a five to twenty-one-year follow-up study. *J Bone Joint Surg Am.* 2001;83-A(7):992-998, who reported 83% and 93% good results respectively in their studies. The irksome complications were femoral stem subsidience, limb length discrepancies and heterotopic ossification.

Soft Tissue Contractures

In our series of 2 cases, both underwent uncemented THA and postoperatively uneventful with excellent to good results. Extensive soft tissue release in the order of capsule, iliopsoas, iliotibial band and gluteus maximus for a better result. Our study results using Harris Hip Score gave 100% excellent results when compared to results worldwide.

Failed Osteosynthesis

In our series of 6 cases(all undergoing cemented THA), 50 % underwent excellent and 50% underwent good results which is better than the results published by India Journal of orthopaedics 2008 July – September 42(3): 279-286.

Our patients had an improved quality of life with good functional outcome and better social and economic productivity.

CONCLUSION

The Primary Total Hip Arthroplasty has revolutionised the treatment of Hip diseases in the past 3 decades. The indications for the primary THA has been extended to complex hip pathologies which were previously considered ineligiblefor the procedure. Such complex hip cases fall into the categories of Developmental Dysplasia Hip Ankylosed Hip, Protrusioacetabuli, Failed Osteosynthesis (previous bony procedures around hip), Skeletal Dysplasia (SED,epiphyseal dysplasia), Neuromuscular disorders (polio, downs syndrome, cerebral palsy, stroke), Prior hip fractures (acetabular fractures), Severe soft tissue contractures around hip and Post excision arthroplasty hip.

The management of these complex hips with altered bony and soft tissue anatomy is challenging with the conventionally available total hip instruments and implants. With the advent of new surgical techniques, implants and instruments, the primary THA in complex hips has given good excellent results which is comparable with the results published worldwide.

From Our study, we recommend preoperative templating is of prime importance in complex hips to select the appropriate modular implants,

specialized surgical techniques and instruments to provide a better outcome in patients undergoing complex primary THA.

The surgical technique employed is unique to each complex case. Surgeon expertise is also a must to deal with complex hips. Complex primary THA is an emerging trend with better clinical and functional outcome with the presently available modular implants and improved surgical techniques.

Sr no	Name	Age/ Sex	IP no	Diagnosis and Treatment	Complication	Harris Hip Score		Result
						Pre-op	Post-op	
1	Jaganathan	37/M	30548	Protrusio (R) hip Uncemented THA	--	70	92	E
2	Arul Anand	40/M	34716	Rheumatoid Arthritis with Bilateral Protrusio (R)Uncemented THA	---	62	91	E
3	Leela	36/F	32712	Protrusio (L) Hip Uncemented THA	---	66	92	E
4	Elumalai	29/M	26179	AS with Protrusio (L) Hip Uncemented THA	--	67	94	E
5	Kamalanarayanan	40/F	56088	Prtrusio (L) Hip Uncemented THA	--	70	85	G
6	Hemanth Kumar	21/M	47461	JRA with protrusion (L) Hip Uncemented THA	--	61	86	G
7	Siva Kumar	28/M	47895	Protrusio (R) Hip Uncemented THA	--	78	95	E

Sr no	Name	Age/ Sex	IP no	Diagnosis and Treatment	Complication	Harris Hip Score		Result
						Pre-op	Post-op	
8	Surendar	50/M	19786	MalunitedAcetabular fracture (R) cemented THA	--	62	88	G
9	Prem	45/M	77868	Malunited fracture Acetabulum with (R) Neglected Hip dislocation Uncemented THA with BG	Bone Graft Resoption	40	64	P
10	Raji	31/M	23814	Central fracturedisclocation (R) Hipprotrusio cemented cup, uncemented stem (Antiprotrusiocage, Bone Graft)	--	66	88	G
11	Ramesh	30/M	25748	Acetabular fracture with screw insitu (R) Uncemented THA	--	62	84	G
12	Kumar	40/M	12548	Old Acetabular fracture with Implant(L) insitu Uncemented THA	Superficial Infection	60	91	E
13	Sudha	28/F	25960	Dysplastic acetabulum (R) Uncemented THA	--	66	93	E
14	Mani	32/M	46408	Grade 3 DDH (L) hip Uncemented THA with BG		52	83	G

Sr no	Name	Age/ Sex	IP no	Diagnosis and Treatment	Complication	Harris Hip Score		Result
						Pre-op	Post-op	
15	Vetrichelvi	38/F	40930	DDH (L) with Schanz osteotomy done Uncemented THA	--	60	86	G
16	Jothi	43/M	49306	Dysplastic Acetabulum (L) Uncemented THA	--	70	92	E
17	Suresh	25/M	15489	DDH (R) Hip Uncemented THA with BG	Bone graft resorption	62	84	G
18	Kuppusami	40/M	11548	Ankylosed (L) Hip Uncemented THA	--	52	84	G
19	Rajika	45/F	33641	Ankylosed (R) Hip Uncemented THA	--	42	79	F
20	Rajesh	21/M	20345	Ankylosed (L) Hip Uncemented THA	Subsidience femoral stem	38	68	P
21	Shankar	33/M	25469	Ankylosed (R) Hip Uncemented THA	Heterotopic ossification	44	77	F

Sr no	Name	Age/ Sex	IP no	Diagnosis and Treatment	Complication	Harris Hip Score		Result
						Pre-op	Post-op	
22	Rajamma	38/F	45789	AS with (L) Hip FFD 80 deg FER 20deg and FAB 30 deg Uncemented THA	–	52	88	G
23	Radhika	21/F	14381	Old SCFE with (R) FFD 80 deg, FAD 30 deg and FER 20 deg Uncemented THA	–	62	86	G
24	Munikannan	41/M	62644	SED with OA (R) Hip Uncemented THA	–	62	94	E
25	Rajalakshmi	50/F	44398	Fracture NOF with Cancellous Screw insitu (R) Cemented THA	–	66	88	G
26	Damodaran	40/M	45689	Pauwel's Osteotomy (R)Hip Cemented THA	–	62	81	G
27	Rani	51/F	33452	Fracture NOF (R) with Implant insitu Cemented THA	–	65	94	E
28	Dhanam	70/F	145689	Failed DHS (L) Hip Cemented THA	–	70	84	G
29	Suman	52/M	54452	Failed hemiarthroplasty (L) Hip Cemented THA	–	65	94	E
30	Ganapathy	65/M	145689	Failed hemiarthroplasty (R) Hip Cemented THA	–	54	96	E

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CLINICAL PROFORMA OF HIP EXAMINATION

Name : _____ Case no : _____

Age : _____ Sex : _____

Date of Admission : ____ Date of Surgery : _____

Presenting Complaints :

_____

_____

_____

Past History : _____

General examination:

_____

_____

Inspection : _____

Palpation : _____

Range of Movements :

Flexion _____ Extension_____

Abduction_____ Adduction_____

Internal Rotation_____ External Rotation _____

Gait :

Aided / Unaided / Unable to walk

Measurements :

Apparent / True Leg length discrepancy

Special tests :

Trendelenburgtest :

Telescopytest :

Ober’stest :

Thomas test :

Other Examinations :

Other joints –

Spine –

Sacroiliac joints -

Chest wall movts -

Intra operative complication:

Immediate post operative complication:

Late post operative complication:

1st Follow up	Date :	Complaints	
		Wound	
		x-ray	
		HARRIS score	
		ROM	
		Advice	
		Asst. Sign	

2st Follow up	Date :	Complaints	
		Wound	
		x-ray	
		HARRIS score	
		ROM	
		Advice	
		Asst. Sign	

3 rd Follow up	Date :	Complaints	
		Wound	
		x-ray	
		HARRIS score	
		ROM	
		Advice	
		Asst. Sign	

ABBREVIATIONS

THA -- Total Hip Arthroplasty

MRI -- Magnetic resonance Imaging

CT -- Computed Tomography

LFA -- Low Friction Arthroplasty

DDH-- Developmental Dysplasia Hip

JRF -- Joint Reaction Force

PMMA—Poly Methyl Methacrylate

MoM-- Metal on Metal

SED --SpondyloEpiphyseal Dysplasia

DVT -- Deep Vein Thrombosis

LMW -- Low Molecular Weight

NSAIDS --Non Steroidal Anti Inflammatory Drugs

AP -- Antero Posterior

POD --Post Operative Day

OD -- Once Daily

(R) -- Right

(L) -- Left

NOF -- Neck Of Femur

JBJS -- Journal of Bone and Joint Surgery


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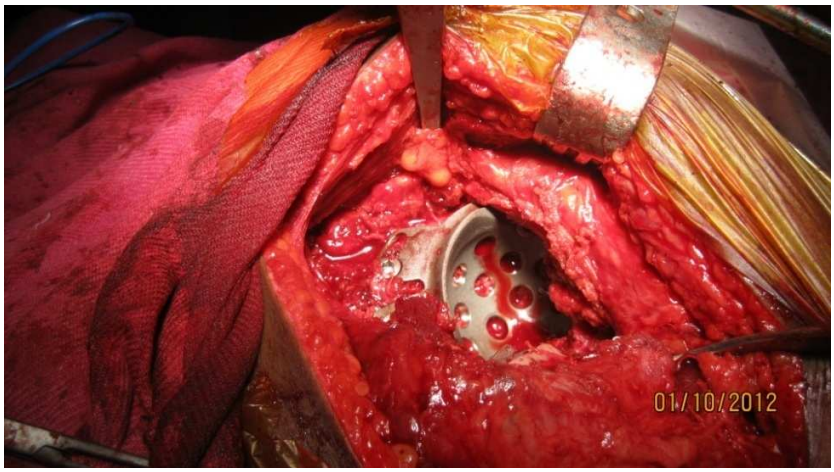
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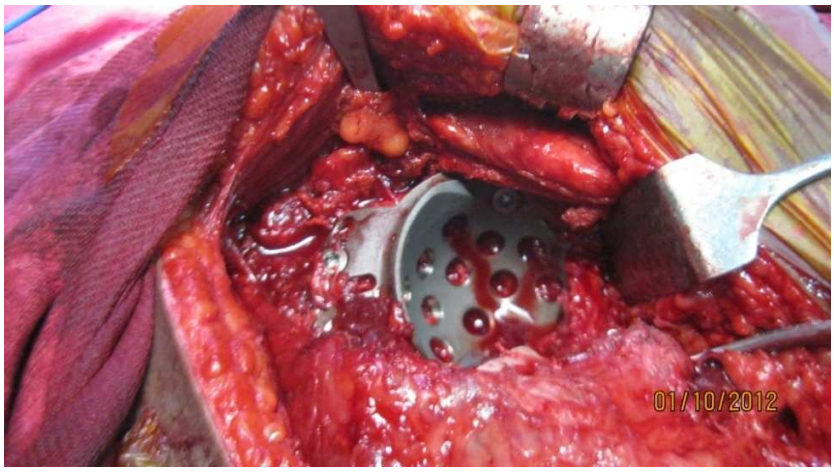
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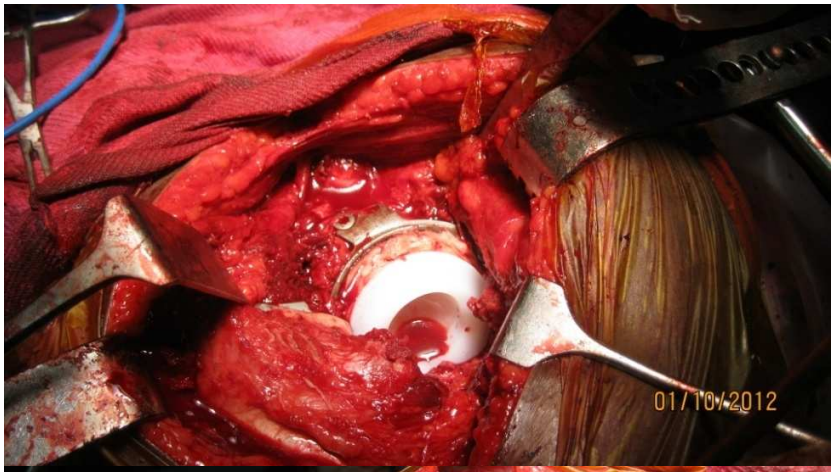
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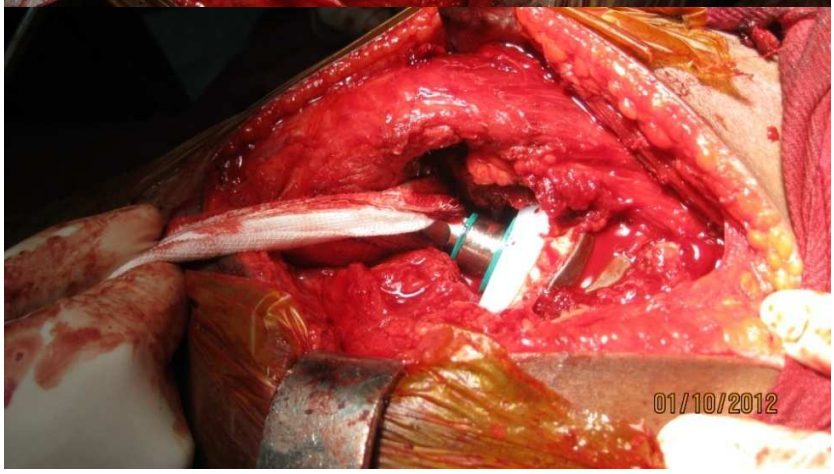
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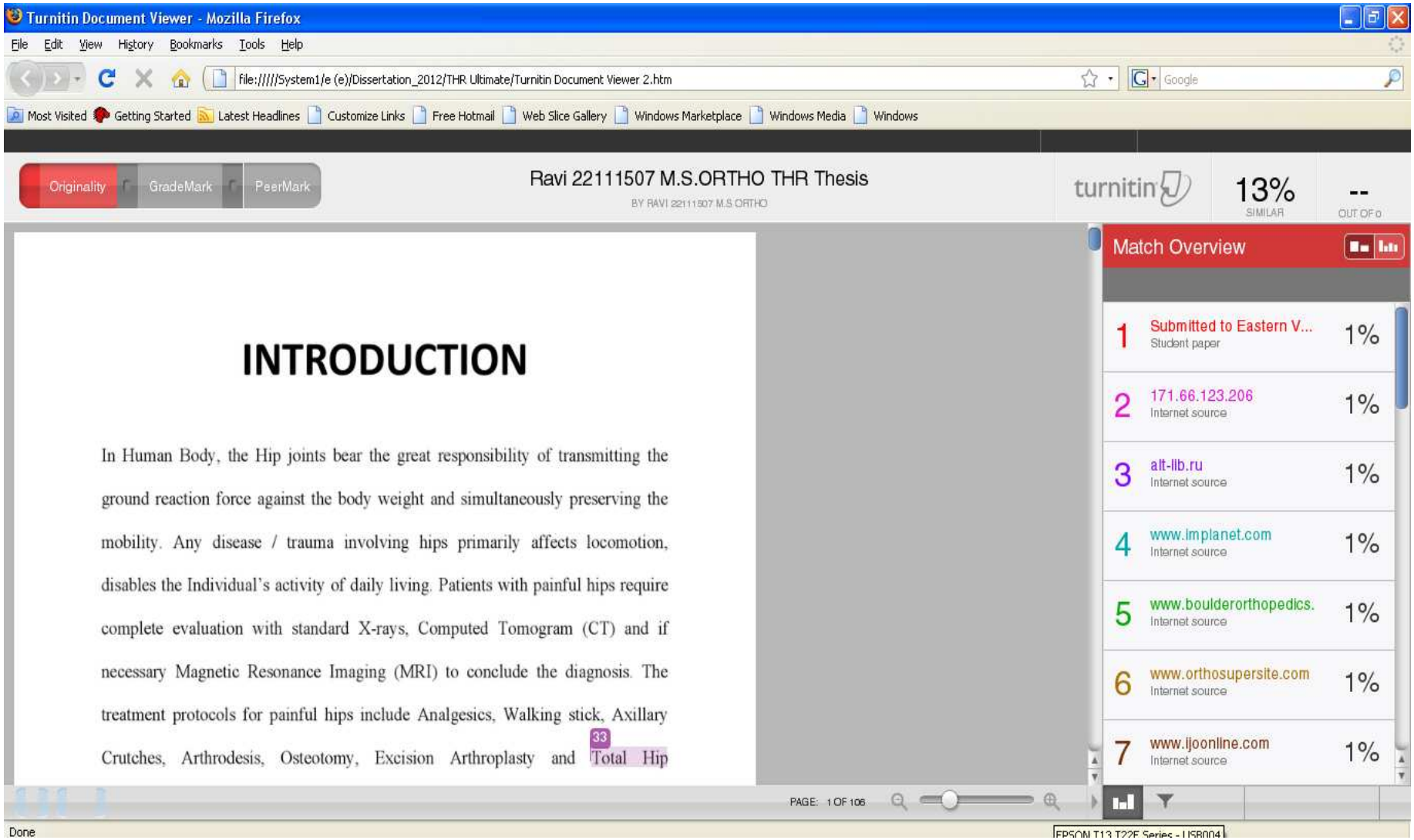
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INTRODUCTION
In Human Body, the Hip joints bear the great responsibility of transmitting the ground reaction force against the body weight and simultaneously preserving the mobility. Any disease / trauma involving hips primarily affects locomotion, disables the Individual's activity of daily living. Patients with painful hips require complete evaluation with standard X-rays, Computed Tomogram (CT) and if necessary Magnetic Resonance Imaging (MRI) to conclude the diagnosis. The treatment protocols for painful hips include Analgesics, Walking stick, Axillary Crutches, Arthrodesis, Osteotomy, Excision Arthroplasty and Total Hip
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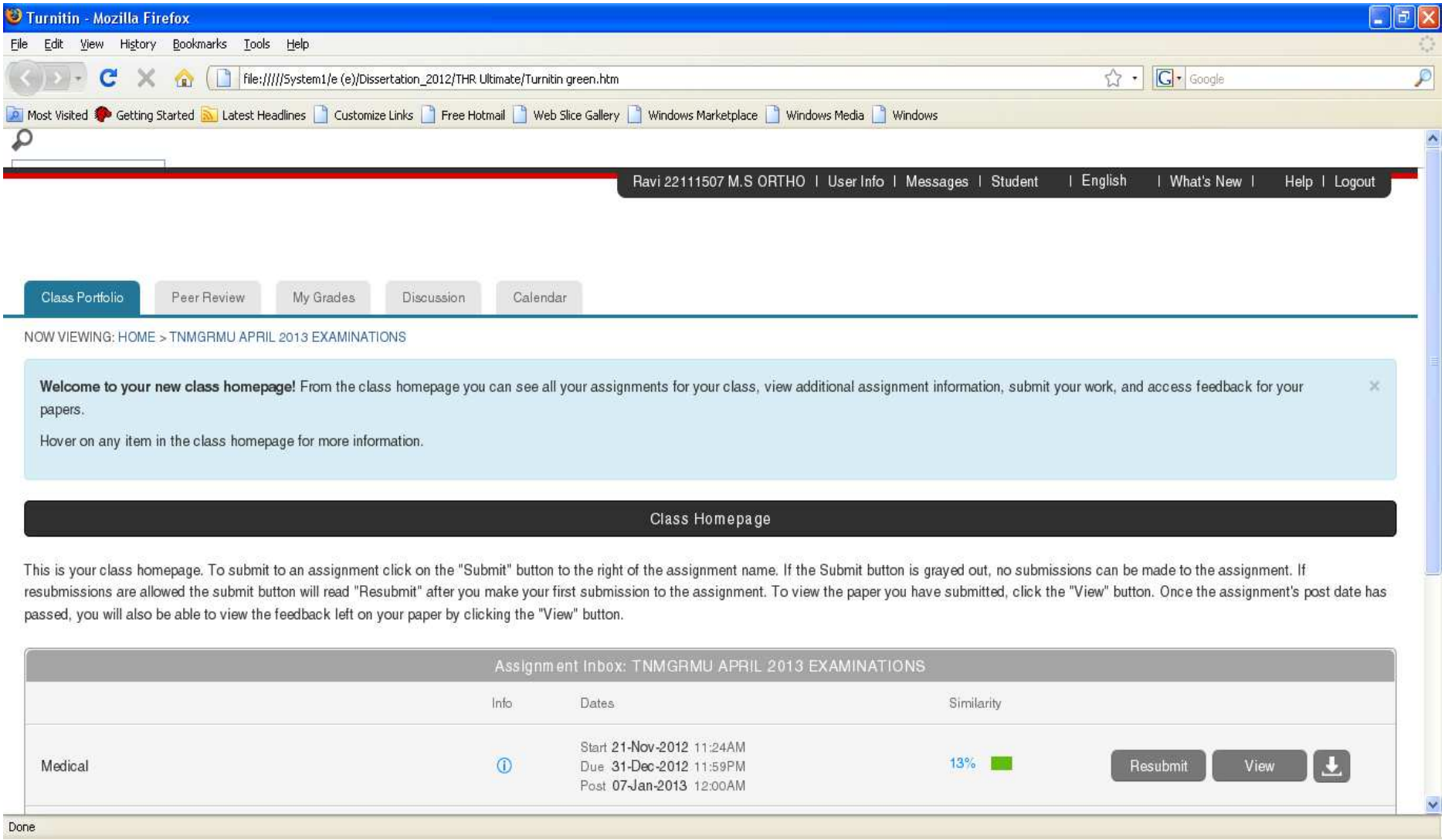
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INTRODUCTION In Human Body, the Hip joints bear the great responsibility of transmitting the ground reaction force against the body weight and simultaneously preserving the mobility. Any disease / trauma involving hips primarily affects locomotion, disables the Individual's activity of daily living. Patients with painful hips require complete evaluation with standard X-rays, Computed Tomogram (CT) and if necessary Magnetic Resonance Imaging (MRI) to conclude the diagnosis. The treatment protocols for painful hips include Analgesics, Walking stick, Axillary Crutches, Arthrodesis, Osteotomy, Excision Arthroplasty and Total Hip Arthroplasty (THA). Total Hip Arthroplasty is the Most commonly...

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI -3

Telephone No : 044 25305301
Fax : 044 25363970

CERTIFICATE OF APPROVAL

To
Dr. M. Ravi
PG in MS Orthopaedics
Madras Medical College, Chennai -3

Dear Dr. M. Ravi

The Institutional Ethics committee of Madras Medical College, reviewed and discussed your application for approval of the proposal entitled "A short term analysis of functional outcome in complex primary total hip replacements" No.12092012.

The following members of Ethics Committee were present in the meeting held on 13.09.2012 conducted at Madras Medical College, Chennai -3.

1. Dr. S.K. Rajan. M.D.,FRCP.,DSc -- Chairperson
2. Prof. Pregna B. Dolia MD -- Member Secretary
   Vice Principal, Madras Medical College, Chennai -3
   Director , Institute of Biochemistry, MMC, Ch-3
3. Prof. B. Vasanthi MD -- Member
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4. Prof. M. Reghu MD -- Member
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5. Prof. MD. Ali. MD.DM -- Member
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6. Prof. P. Karkuzhali. MD -- Member
   Director i/c, Prof., Inst. of Pathology, MMC, Ch-3
7. Prof. Bavani Shankar. MS -- Member
   Prof of General Surgery, MMC, Ch-3
8. Thiru. S. Govindsamy. BABL -- Lawyer
9. Tmt. Arnold Soulina MA MSW -- Social Scientist

We approve the proposal to be conducted in its presented form.

Sd/ Chairman & Other Members

The Institutional Ethics Committee expects to be informed about the progress of the study, and SAE occurring in the course of the study, any changes in the protocol and patients information / informed consent and asks to be provided a copy of the final report.

Member Secretary, Ethics Committee